

# Public Health Reports

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## UNITED STATES.

*United States quarantine regulations to be enforced against plague.*

DEPARTMENT OF STATE, *Washington, January 19, 1897.*

SIR: Referring to your letter of the 18th instant, I have the honor to inform you that our consul at Bombay was yesterday instructed by cable in accordance with your request, as follows:

“Treasury quarantine cholera regulations apply to plague, with fifteen days’ detention exposed persons.”

I have the honor to be, sir, your obedient servant,

RICHARD OLNEY,  
*Secretary of State.*

HON. SECRETARY OF THE TREASURY.

[Reports to the Supervising Surgeon-General United States Marine-Hospital Service.]

### FORMALDEHYDE AS A DISINFECTING AGENT AND ITS PRACTICAL APPLICATION.

HYGIENIC LABORATORY, U. S. MARINE-HOSPITAL SERVICE,  
*January 29, 1897.*

SIR: In view of great interest manifested by the health authorities concerning the use of formaldehyde gas as a disinfecting agent, I have the honor to transmit herewith an article on this subject, which embodies the results of investigations conducted in the hygienic laboratory.

Respectfully submitted,

J. J. KINYOUN,  
*Passed Assistant Surgeon, U. S. M. H. S.*

The substance designated as formaldehyde has been known since 1868. It was discovered by Von Hoffman. He obtained it from wood alcohol by passing the vapor of the alcohol mixed with air over finely divided platinum or copper. It was considered

more or less of a chemical curiosity until a few years ago, when the manner of production was brought to a more perfect state and the cost of methyl alcohol was lessened.

The principle upon which this agent is now produced is practically the same process as described by Von Hoffman. Quite a number of apparatus have been devised for this purpose. Among these the one of Trillat is perhaps the best for generating it in large quantities for the manufacture of formalin or formol. This apparatus volatilizes the alcohol when the vapor is mixed with a requisite amount of air and impinged on platinum, platinized asbestos, or upon heated coke

In 1894, while in Berlin, my attention was called to a product of the chemical works of E. Schering, known to the trade under the name of "Formalin." This was a watery solution containing about 40 per cent of formaldehyde gas. It was claimed that this solution possessed disinfecting properties to a wonderful degree, and was equal to bichloride of mercury as a germicide. .

During the early part of 1895 preparations were made to take up the subject, with a view to determining the availability of such solutions for preparing specimens for museum purposes, as well as for class demonstrations, and it was found to suit the purpose admirably. Soon after this experiments were undertaken to determine whether its range of usefulness could not be extended to the domain of practical disinfection. As my former experiences with gaseous disinfectants had not given flattering results, I was quite skeptical of the claims which were beginning to be advanced concerning the efficiency of this agent.

The literature on the production of formaldehyde gas and its estimation is quite replete, while the literature of formaldehyde as a disinfectant is not only small but conflicting. On account of this it has become necessary to review the subject at length in an attempt to arrive at a conclusion.

FORMALIN AS A GERMICIDE.

As a preliminary to the subject it was necessary to confirm or disprove many of the statements of those who had written upon this subject. This part of the work has been assigned chiefly to my colleague, Passed Assistant Surgeon Geddings, who has been associated with me in conducting the numerous experiments. There seems to be little variation in the conclusions of observers on the antiseptic and disinfecting properties of the solution of "formalin" or "formol." The results were fairly constant. The strength of the solutions required to inhibit the growth of micro-organisms, notably anthrax spores, has been stated to be 1-15000 by some, while others place it at 1-2000. Our results were 1-2000; as a germicide 1-40000 retarded growth.

The following tables are taken as comparisons :

*Results obtained with formic aldehyde.*

MIQUEL.

K. WALTER.

Strength of solutions.		Concentration.	Anthrax.
1 : 10000.....	Putrified bouillon + m. (1)	2 : 100.....	No growth.
1 : 5000.....		1 : 100.....	No growth.
1 : 3333.....		2 : 1000.....	No growth.
1 : 2500.....		1 : 1000.....	No growth.
1 : 2000.....		1 : 2000.....	No growth.
1 : 1666.....	Bouillon unaltered.	1 : 500.....	No growth.
1 : 1430.....		1 : 10000.....	No growth.
1 : 1250.....		1 : 20000.....	Slight growth.
1 : 1111.....		1 : 50000.....	Rich growth.
1 : 1000.....		1 : 100000.....	Rich growth.
1 : 910.....		Control.....	Rich growth.
1 : 833.....			

## HYGIENIC LABORATORY, UNITED STATES MARINE-HOSPITAL SERVICE.

## EXPERIMENT I.

*Formalin in solution 1-5000 for the time below indicated.*

Organism.	Control.	1 min.	2 min.	3 min.	5 min.	10 min.	15 min.	30 min.	60 min.
Staph. pyogenes Au.....	Growth normal.	Growth retard.	Growth retard.						
B. Diphth.....	Growth.	Growth normal.							
Formalin solution 1-4000 for the times named.									
Staph. pyogenes Au.....	Growth.	Growth normal.	Growth normal.	Growth normal.	Growth normal.	Growth normal.	Growth retard.	Growth retard.	Growth retard.
B. Diphth.....	Growth.	Growth normal.	Growth normal.	Growth normal.	Growth normal.	Growth normal.	Growth normal.	Growth retard.	Growth retard.
Formalin solution 1-3000 for the times named.									
B. Diphth.....	Growth.	Growth retard.							
Formalin solution 1-2000 for the times named.									
B. Anthrac.....	Growth.	None.							
Formalin solution 1-1000 for the time named.									
B. Anthrac.....	Growth.	None.							
Formalin solution 1-500 for the time named.									
B. Anthrac.....	Growth.	None.							

The experiments were conducted with two products of the formaldehyde gas, one known as "formalin," a watery solution containing 40 per cent of the gas by weight, and the other known as "formol," a solution in methyl alcohol containing about 40 per cent of the gas (this latter is inflammable). It is a well-known fact that when either of these solutions are exposed to the air they lose a considerable quantity of the gas—in fact, a quantity sufficiently large is thrown off to act as a disinfectant. Especially has it been observed, when these are exposed on large surfaces, in a small space, so energetic and efficient has this been that one is led at first to believe that all that is required for rapid and sufficient disinfection of articles and apartments would be to employ formaldehyde in this manner.

While this method has proven satisfactory for laboratory experiments, conducted on a small scale, it has been quite disappointing when applied to the disinfection of rooms and their contents. The reason for the discrepancy in the results appears to be due to the following: Solutions of formaldehyde when exposed to the air lose a certain proportion of their gas and aqueous vapor. After the evaporation has progressed for some time the liquid becomes more concentrated and the greater proportion of the formaldehyde gas is converted into a yellowish white amorphous substance known as trioxymethelene. In this state it gives off but a very slight amount of formaldehyde, and that slowly. On this account it would require very large quantities of the solution, if

the method were otherwise practicable. The experiments conducted to determine the germicidal properties of the gas were made by using a large bell jar, to which was attached a vacuum apparatus and a tubulated bottle filled with cotton wool saturated with formalin. A stream of air could be drawn through the formalinated cotton and thence to the bell jar until a saturated atmosphere of the gas was obtained. Cover slips, containing an even layer of the micro-organism to be tested, were prepared and dried and then exposed to this atmosphere, after which the gas was neutralized and the specimen planted over into bouillon or inoculated into animals, as the case required.

The following is a summary of the experiments :

**EXPERIMENT II.**

*Results of experiments on the disinfecting and germicidal value of formalin (formaldehyde).*

Bouillon cultures of the following organisms were spread on cover slips and allowed to dry, then exposed to the action of a saturated atmosphere of formalin for the time indicated, and the slips then planted into bouillon and kept at a temperature of 37° C. for 24 and 48 hours.

Organism.	Control.	1 min.	2 min.	3 min.	5 min.	10 min.	15 min.	30 min.	60 min.
Staph. Pyogenes Aur.....	Growth.	None.							
Results after forty-eight hours—the same as above.									
Spirillum Finkler Prior.....	Growth.	None.							
Confirmed by a second series of experiments with identical results.									
Spirillum cholera Asiat.....	Growth.	Growth.	None.						
Similar results after forty-eight hours.									
B. Coli Com.....	Growth.	Growth.	Growth.	Growth.	Growth.	None.	None.	None.	None.
Similar results after forty-eight hours.									
B. typhoid .....	Growth.	Growth.	Growth.	Growth.	Growth.	None.	None.	None.	None.
Similar results after forty-eight hours.									
B. Dipth.....	Growth.	Growth.	Growth.	None.	None.	None.	None.	None.	None.
Similar results in forty-eight hours.									
B. glanders .....	Growth.	Growth.	None.						
Similar results in forty-eight hours.									

## EXPERIMENT II—Continued.

Dip. Pneum. partially dry.....	Growth.	Growth.	None.						
Dip. Pneum. dried	Growth.	None.	None.	None.	None.	None.	None.	None.	None.
B. Pyocyan.....	Growth.	Growth.	None.						
B. Anthrac. with spores .....	Growth.	Growth.	None.						
A second series of experiments gave identical results in forty-eight hours.									
B. Tetanus, fatal to mice.....	Death.	None.	None.	None.	None.	None.	None.	None.	None.
B. of bubonic plague.....	Growth.	None.	None.	None.	None.	None.	None.	None.	None.

The amount of gas evolved by this method is considerably more than when it is evolved by placing a given quantity in a receptacle and allowing it to be diffused by evaporation. It was found that 1.25 volumes per cent was evolved by the former method and about 1 volume per cent by the latter. Numerous experiments have been conducted upon the power of atmospheric solutions of this gas to sterilize fabrics and other articles which had been infected with some pathogenic bacteria. The results were in every way satisfactory, as the germs were quickly destroyed even when they were in a dried state. Articles containing cultures of bacteria, which were protected by several layers of the material, did not give the same results as in the former. The results were extremely varying and inconstant. The cause of this appeared to be due to the inability of the gas to penetrate into the interior of the fabrics. It was especially noticeable where there was any considerable moisture on the surfaces of the article. The moisture appeared to arrest the gas, much after the manner of moisture arresting the penetration of sulphur dioxide, but even to a greater degree.

Another factor which is equally responsible for preventing penetration is the fact that formaldehyde has the peculiar property of being absorbed, or perhaps forming a loose chemical combination with woolen goods, hair, and leathers. These substances when exposed to the action of the gas will absorb considerable quantities, and for sometime after they will slowly evolve formaldehyde, much after the manner of trioxymethelene. When these experiments were repeated on a larger scale—for instance, in a room—the results were even more variable, and the arrest of the gas on the surfaces by the moisture, etc., was even more apparent.

Statements have been made that for room disinfection all that is required is to saturate clothes with formalin and hang them up in the room; allow the room to be closed for a given time, when it will be found to be disinfected.

Our results do not confirm this.

At this juncture it might be well to remark upon the effects of the formaldehyde gas and its solutions upon textile fabrics, hair, fur, and leather. Experiments were made by subjecting samples of wool, cotton, fur, and leather goods of every description to crucial tests, using solutions of various strengths and a saturated atmosphere of the gas.

The results obtained were in every way satisfactory. Of over 225 different samples of wool, silk, cotton, linen, leather, and hair subjected, there was no change observed in textile character, even when they were soaked in a strong solution of the gas.

*Effect on colors.*—Little if any change occurred in the colors of the fabrics; only three of the number showed any change. These were two shades of violet, and one a light red. These were coal-tar colors, and were also quickly bleached by the sun.

*Effect on metals.*—Iron and steel are attacked by the gas, and more so by its solutions. Copper, brass, nickel, zinc, and gilt work are not acted upon. The effect of the substance on iron should be borne in mind if iron disinfecting chambers are used for applying the gas. If this be the case, the surface of the interior of the chamber should be protected by paint or varnish.

After subjecting textile fabrics to the action of the gas, there always remains a considerable quantity of the formaldehyde in combination with the materials, which is slowly given off for a considerable time thereafter. This is especially so in the case of mattresses and feather pillows.

This is best obviated by subsequently exposing the article to the fumes of ammonia, which neutralizes the formaldehyde by converting it into a formamide—a rather stable body, possessing germicidal properties of no small value, and not prone to undergo decomposition. Dr. Geddings' experiments with formamide give the following effects on anthrax spores :

EXPERIMENTS WITH FORMAMIDE.

EXPERIMENT III.

To formalin (containing 40 per cent formaldehyde) was added an equal volume of strong ammonia water (26° B. 20 per cent), and the resulting formamide obtained by evaporation to dryness. The salt was dissolved in bouillon in the following percentages, and the following organisms subjected to experiment therewith :

Organism.	Control.	1 per cent.	2 per cent.	3 per cent.	4 per cent.	5 per cent.	6 per cent.	7 per cent.	8 per cent.	9 per cent.	10 per cent.
B. Anthrac .....	Growth.	None.									

Organism.	Control.	0.1 per cent.	0.2 per cent.	0.3 per cent.	0.4 per cent.	0.5 per cent.	0.6 per cent.	0.7 per cent.	0.8 per cent.	0.9 per cent.	1 per cent.
B. Diphth .....	Growth.	None.	None.								
B. Anthrac .....	Growth.	Growth.	None.	None.							

EXPERIMENT IV.

*Formides of barium, calcium, sodium, copper, and silver.*—Their effect upon Anthrax spores.

[Time, twenty-four hours at 37° C.]

	Control.	1-100	1-200	1-300	1-400	1-500	1-600	1-700	1-800	1-900	1-1000
Anthrax.....	Growth.	None.									

No change in the above results in forty-eight and seventy-two hours at 37° C.

Agent.	Control.	1-1250.	1-1500.	1-2000.
Barium formide.....	Growth.	None.	None.	None.
Calcium formide.....	Growth.	None.	None.	None.
Sodium formide.....	Growth.	None.	None.	None.
Copper formide.....	Growth.	None.	None.	None.
Silver formide.....	Growth.	None.	None.	None.

Agent.	Control.	1-2500.	1-3000.
Barium formide.....	Growth.	None.	Growth.
Calcium formide.....	Growth.	None.	Growth.
Sodium formide.....	Growth.	None.	Growth.
Copper formide.....	Growth.	None.	Growth.
Silver formide.....	Growth.	Growth.	Growth.

No change in the above results in forty-eight and seventy-two hours at 37° C.

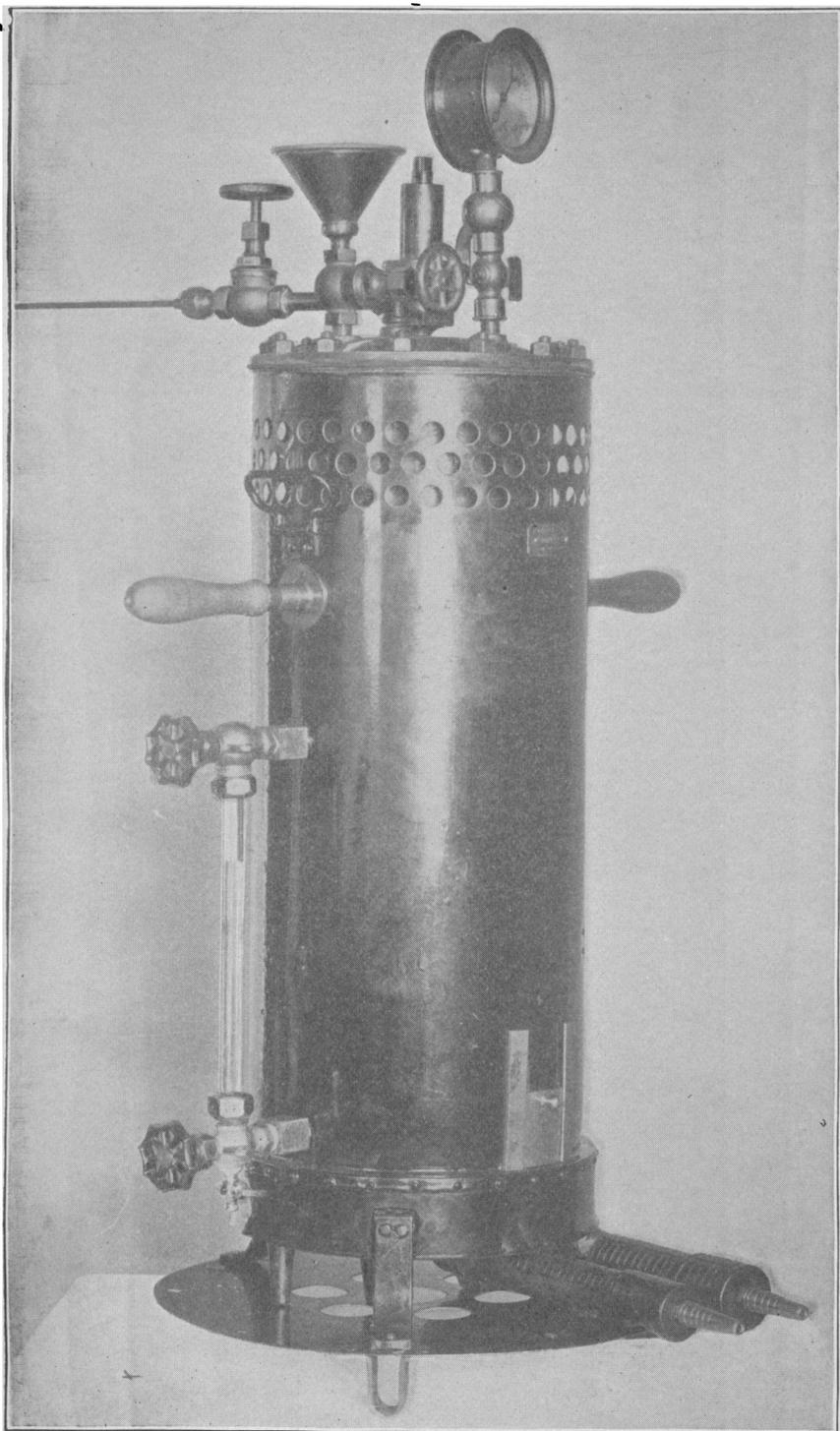


FIG. 1.

These experiments show that all these formides possess decided germicidal properties, and suggest their application to surgery, as they are much less poisonous than solutions of the same strength of mercuric chloride.

The formamide, particularly, would be useful in the sterilization and preparation of catgut suture materials. It would serve a double purpose in neutralizing the free formaldehyde in the catgut, and subsequently act as a preservative.

#### PENETRATION OF FORMALDEHYDE GAS.

Having observed the variable results attending exposures under ordinary conditions, it became apparent that some other means would have to be devised in order to have the gas penetrate the object readily and thoroughly. To this end, the vacuum process was brought into requisition. A small apparatus was arranged after the following manner: A large bell jar was attached to a vacuum pump, which by another opening was attached to a flask containing cotton wool saturated with formalin, or formol.

The jar was charged with the articles to be disinfected, and then closed; when a vacuum of half an atmosphere was produced, air was then allowed to pass through the formalinated cotton wool, replacing the air taken out of the bell jar. By this means cultures of pathogenic bacteria were readily killed, even when protected by several layers of woolen cloth. The only criticism which could be offered was that there was still a considerable quantity of moisture holding formaldehyde in suspension precipitated on the surfaces of the articles. Notwithstanding this drawback, these experiments were of great value in demonstrating how the bulkier objects can be penetrated by the gas. The manner in which the presence of moisture was prevented remained to be pointed out by Roux and Baudet, who have satisfactorily solved this difficulty. They employed special apparatus for evolving formaldehyde gas in practically a dry state, and in such quantities as were desired. They accomplished this by means of heating a small boiler, partly filled with the formalin solution, when the formaldehyde was driven off. In order to have the gas in as dry state as possible, the moisture is held back by means of a neutral chloride, preferably the chloride of calcium.

A given quantity of formalin is mixed with an equal quantity of 5 to 10 per cent solution of calcium chloride, as the boiling point of this mixture is considerably over 100° C. (from 103°–106°), and the most favorable temperature for evolving the formaldehyde gas is between 95° and 100° C. it can be seen wherein the advantage lies. Nearly all the gas is evolved before the water in the mixture is given off as steam. Moreover it presents the polymerization of the gas into trioxymethelene.

#### APPARATUS FOR EVOLVING FORMALDEHYDE GAS FROM FORMALIN.

Early in August of 1896, with the aid of Mr. J. B. Pratt, of the Coast and Geodetic Survey, plans for a similar boiler to that described by Roux and Baudet were designed and the boiler soon thereafter constructed. The apparatus is shown in an accompanying cut (Fig. 1). It is constructed after the following manner: A small boiler of  $\frac{1}{2}$  inch copper, 6 $\frac{1}{2}$  inches in diameter by 17 $\frac{1}{2}$  inches high, closed at one end by a removable head, which is fastened to the boiler by bolts. It is capable of withstanding a pressure of 200 pounds to the square inch. On the head are the filling funnel, pressure gauge, safety valve, and discharge pipe. A drain pipe is fitted to the lower end of the boiler, and connects with the water gauge at the side. The boiler is supported by an iron collar or jacket, and is so arranged for applying heat. In the cut gas-burners are shown, but now a gasoline torch has been substituted for these. As this works so admirably it is recommended instead of the gas attachment. A pair of removable handles are attached near the top for transporting the boiler from place to place.

*Method of operating.*—The solution of calcium chloride is poured into the boiler, then the required amount of formalin; all valves and stopcocks closed and heat applied

through the opening under the boiler until the pressure registers from 75 to 90 pounds, when a small  $\frac{1}{4}$ -inch pipe is attached and passed through the keyhole of the door of the apartment. The gas should be liberated rather rapidly. As soon as the pressure falls to about 5 pounds the boiler is again heated to the same degree as formerly, and again discharged. The two heatings set free nearly all the formaldehyde gas.

The amount of formaldehyde gas evolved from a liter of the formalin is about 1,450 liters—at ordinary temperature (17° C.). It can readily be calculated how much formalin will be required to form a certain per volume strength.

This apparatus is particularly adapted for the disinfection of rooms, and has been of great value as an aid in carrying out the several experiments.

#### ROOM DISINFECTION.

Through the courtesy of the health officer of the District of Columbia the wards and rooms of the new smallpox hospital were placed at our disposal for the purpose of making the proposed tests in the disinfection of rooms. The following are some of the experiments:

*Room A.—Capacity, 7,400 cubic feet; percentage of formaldehyde, 0.5; time, 23 hours.*

a. Character of experiment—cultures on Petri dishes, covered with filter paper, and enveloped in 10 layers of blanket: Anthrax, no growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

b. Cultures spread on cover slips, placed in double envelopes, one sealed with paraffin and enveloped in 10 layers of blanket: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

c. Cultures on Petri dishes, covered with filter paper, and enveloped in 36 layers of new cotton sheeting: Anthrax, no growth; diphtheria, no growth.

d. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and enveloped in 36 layers of new cotton sheeting: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

e. Cultures on Petri dishes, covered with filter paper, and enveloped loosely in a blanket gathered into a bag: Anthrax, no growth; diphtheria, no growth; *S. pyogenes aureus*, no growth.

f. Cultures spread on cover slips, placed in double envelopes, and enveloped loosely in a blanket gathered into a bag: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, growth.

g. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and enveloped in three sheets gathered loosely into a bag: Anthrax, growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, growth.

h. Cultures on cover slips, placed in double envelopes, the inner one sealed with paraffin, and exposed on mantel in room: Anthrax, growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

i. Cultures on Petri dishes, covered with filter paper, and exposed on mantel in room: Anthrax, no growth; typhoid, no growth; diphtheria, no growth.

k. Cultures on cover slips, in double sealed envelopes, placed between the leaves of a book, and exposed in the room: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

*Room B.—Capacity, 10,500 cubic feet; percentage of formaldehyde, 0.25; time, 23½ hours.*

a. Cultures on Petri dishes, covered with filter paper, and enveloped in 10 layers of blanket: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

b. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with

paraffin, and enveloped in 10 layers of blanket: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

c. Cultures on Petri dishes, covered with filter paper, and enveloped in 36 layers of new cotton sheeting: Anthrax, no growth; diphtheria, no growth.

d. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and wrapped in 36 layers of new cotton sheeting: Anthrax, no growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

e. Cultures on Petri dishes, covered with filter paper, and wrapped in a blanket, loosely gathered into a bag: Anthrax, no growth; diphtheria, no growth; *S. pyogenes aureus*, no growth.

f. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and wrapped in a blanket loosely gathered into a bag: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, no growth.

g. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and wrapped in three sheets loosely gathered into a bag: Anthrax, no growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

h. Petri dishes containing cultures and covered with filter paper, and exposed on mantel in room: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

i. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and exposed on mantel in room: Anthrax, no growth; diphtheria, no growth; *S. pyogenes aureus*, no growth.

k. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and exposed in the interior of a closed book: Anthrax, growth; diphtheria, growth; *S. pyogenes aureus*, growth.

*Room C.—Capacity, 3,300 cubic feet; percentage of formaldehyde, 1.00; time, 22 hours.*

a. Cultures on Petri dishes, covered with filter paper, and enveloped in 10 layers of blanket: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

b. Cultures, spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and enveloped in 10 layers of blanket: Anthrax, no growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

c. Cultures on Petri dishes, covered with filter paper, and wrapped in 36 layers of new cotton sheeting: Anthrax, growth; diphtheria, no growth.

d. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and enveloped in 36 layers of new cotton sheeting: Anthrax, lost; diphtheria, no growth; *S. pyogenes aureus*, growth.

e. Cultures in double envelopes, the inner one sealed with paraffin, and wrapped in folds of 3 sheets gathered into a bag: Anthrax, no growth; typhoid, no growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

f. Cultures in Petri dishes, covered with filter paper, and exposed on mantel in room: Anthrax, no growth; diphtheria, no growth; typhoid, no growth.

g. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and exposed on mantel in room: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

h. Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and exposed between the leaves of a closed book: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

*Room I.—Percentage formaldehyde, 2; time, 23 hours.*

a. Cultures on Petri dishes, covered with filter paper, and wrapped in 10 layers of blanket: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

b. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with

paraffin, and wrapped in 10 layers of blanket: Anthrax, no growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

c. Culture on Petri dish, covered with filter paper, and wrapped in 36 layers of new cotton sheeting: Anthrax, growth.

d. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and wrapped in 36 layers of new cotton sheeting: Anthrax, no growth; diphtheria, no growth; typhoid, growth; *S. pyogenes aureus*, growth.

e. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and exposed between the leaves of a closed book: Anthrax, growth; diphtheria, growth; typhoid, growth; *S. pyogenes aureus*, growth.

*Room E.—Capacity, 3,300 cubic feet; percentage of formaldehyde, 1.00; time, 47½ hours.*

a. Cultures on Petri dishes, covered with filter paper, and enveloped in 10 folds of blanket: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, no growth.

b. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and enveloped in 10 layers of blanket: Anthrax, growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

c. Cultures on Petri dishes, covered with filter paper, and enveloped in 36 layers of new cotton sheeting: Anthrax, no growth; diphtheria, no growth; typhoid, no growth.

d. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and enveloped in 36 layers of new cotton sheeting: Anthrax, growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

e. Cultures on Petri dishes, covered with filter paper, and exposed on mantel in room: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

f. Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and exposed on mantel in room: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

g. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and exposed between the leaves of a closed book: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

*Room F.—Capacity, 10,500 cubic feet; percentage of formaldehyde, 0.25; time, 48 hours.*

a. Cultures on Petri dishes, covered with filter paper, and enveloped in 10 layers of blanket: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

b. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and enveloped in 10 layers of blanket: Anthrax, growth; diphtheria, growth; *S. pyogenes aureus*, growth.

c. Cultures on Petri dishes, covered with filter paper, and enveloped in 36 layers of new cotton sheeting: Anthrax, growth; diphtheria, no growth.

d. Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and enveloped in 36 layers of new cotton sheeting: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

e. Cultures on Petri dishes, covered with filter paper, and enveloped in the folds of 1 blanket gathered loosely into a bag: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, no growth.

f. Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and enveloped in the folds of a blanket gathered loosely into a bag: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, no growth.

g. Cultures spread on cover slips and placed in double envelopes, the inner one

sealed with paraffin, and enveloped in the folds of 3 sheets gathered loosely into a bag: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

*h.* Cultures on Petri dishes, covered with filter paper, and exposed on mantel in room: Anthrax, growth; diphtheria, no growth; typhoid, no growth.

*i.* Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and exposed on mantel in room: Anthrax, growth; diphtheria, growth; *S. pyogenes aureus*, no growth.

*k.* Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and exposed between the leaves of a closed book: Anthrax, growth; diphtheria, growth; *S. pyogenes aureus*, growth.

*Room G.*—Capacity, 7,400 cubic feet; percentage of formaldehyde, 0.50; time, 48 hours.

*a.* Cultures on Petri dishes, covered with filter paper, and enveloped in 10 layers of blanket: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

*b.* Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and enveloped in 10 layers of blanket; Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

*c.* Cultures on Petri dishes, covered with filter paper, and enveloped in 36 layers of new cotton sheeting: Anthrax, no growth; diphtheria, no growth.

*d.* Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and enveloped in 36 layers of new cotton sheeting: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, growth.

*e.* Cultures on Petri dishes, covered with filter paper, and enveloped in folds of a blanket loosely gathered into a bag: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

*f.* Cultures spread on cover slips and placed in envelopes, the inner one sealed with paraffin, and enveloped in the folds of a blanket gathered loosely into a bag: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, no growth.

*g.* Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and enveloped in the folds of 3 sheets loosely gathered into a bag: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, growth.

*h.* Cultures on Petri dishes, covered with filter paper, and exposed on mantel in room: Anthrax, no growth; diphtheria, no growth; typhoid, no growth.

*i.* Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and exposed on mantel in room: Anthrax, no growth; diphtheria, no growth; typhoid, no growth; *S. pyogenes aureus*, growth.

*k.* Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and exposed between the leaves of a closed book: Anthrax, growth; diphtheria, growth; *S. pyogenes aureus*, growth.

*Room H.*—Capacity, 980 cubic feet; percentage of formaldehyde, 2.00; time, 47 hours.

*a.* Cultures on Petri dishes, covered with filter paper, and enveloped in 10 layers of blanket: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, no growth.

*b.* Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin, and enveloped in 10 layers of blanket: Anthrax, growth; diphtheria, growth; *S. pyogenes aureus*, growth.

*c.* Cultures on Petri dishes, covered with filter paper, and enveloped in 36 layers of new cotton sheeting: Anthrax, no growth; diphtheria, no growth.

*d.* Cultures spread on cover slips and placed in double envelopes, the inner one sealed

with paraffin, and enveloped in 36 layers of new cotton sheeting: Anthrax, growth; diphtheria, no growth; *S. pyogenes aureus*, no growth.

e. Cultures on Petri dishes, covered with filter paper, and exposed on floor of room: 3 anthrax, no growth; diphtheria, no growth; typhoid, no growth.

f. Cultures in double envelopes, exposed between the leaves of a closed book: Anthrax, growth; diphtheria, growth; *S. pyogenes aureus*, growth.

The above experiments demonstrate that the gas is a reliable disinfectant for surfaces and for the lighter articles, such as curtain hangings, clothing, carpets, and bed coverings. The gas was germicidal in all save where the test cultures were tightly wrapped in many layers of the fabric. Interiors of books were difficult to disinfect.

It is doubtful whether the interior of articles such as upholstered furniture, mattresses, and pillows can always be disinfected unless a much larger percentage of the gas is applied than was used in the above experiments.

The main obstacle in the way of applying formaldehyde gas, or any other gaseous disinfectant for that matter, is in not being able to close the apartment sufficiently tight to prevent the escape of the larger part of the gas. In our experiments extra precaution was taken to close all avenues, and yet, notwithstanding this, there was but little gas present, in comparison, after thirty-six hours had elapsed. The only way this can be guarded against is by using an excess of the gas. Just in what proportion the excess should be will entirely depend upon the local conditions.

It occurs that the length of exposure is secondary to the amount of gas used. A large per volume strength will accomplish the object better and in a shorter time than by using a small amount of the gas and prolonging the exposure. For room disinfection, under favorable conditions, fully twelve hours' exposure should be given. After twenty-four hours it is believed little or nothing will be accomplished.

#### DEVICE FOR USING FORMALDEHYDE GAS IN CONNECTION WITH DISINFECTING CHAMBERS.

Taking advantage of our experiences, I am convinced that as a matter of economical application and for absolute certainty of disinfecting, the following method of applying the gas to the bulkier objects, difficult of penetration, will commend itself. This, I may say, is a modification of the method which was first proposed by the writer in 1895, while at Denver, Colo., and later at the meetings of the American Public Health Association at Buffalo, N. Y.

Formaldehyde gas in the dry state penetrates rather slowly but surely. The process can be greatly hastened if a vacuum be used in conjunction with it.

An attachment for the application of the gas has been devised, so that the ordinary steam disinfecting chamber can be adapted for this purpose. The proposed apparatus is delineated in the accompanying illustration under Fig. 2. It consists essentially of the following: Two small boilers, one of copper and the other iron, are provided with coils of steam pipe for heating the liquids. On the top or upper side are placed the filling attachment, pressure gauge, and discharge pipes. On the sides are the water gauges and drips. The discharge pipes of both boilers are connected with the interior of the disinfecting chambers by a common opening. The copper boiler is intended to be used in the same manner as the portable formalin boiler hereinbefore described (Fig. 1). The one constructed of iron is intended for using solutions of ammonia for neutralizing the formaldehyde gas on completion of the disinfection.

Compressed ammonia gas can be substituted for the second boiler. The ammonia gas can be let into the chamber by means of a pressure regulating valve. This method is preferable where a large amount of disinfection is carried on.

*Method of operating.*—The chamber is charged with the articles to be disinfected; the doors closed and made fast, and the air exhausted by means of the vacuum apparatus, to within half an atmosphere. Synchronously with this operation, the mixture

Showing attachment of boilers, etc., to steam disinfecting chamber.

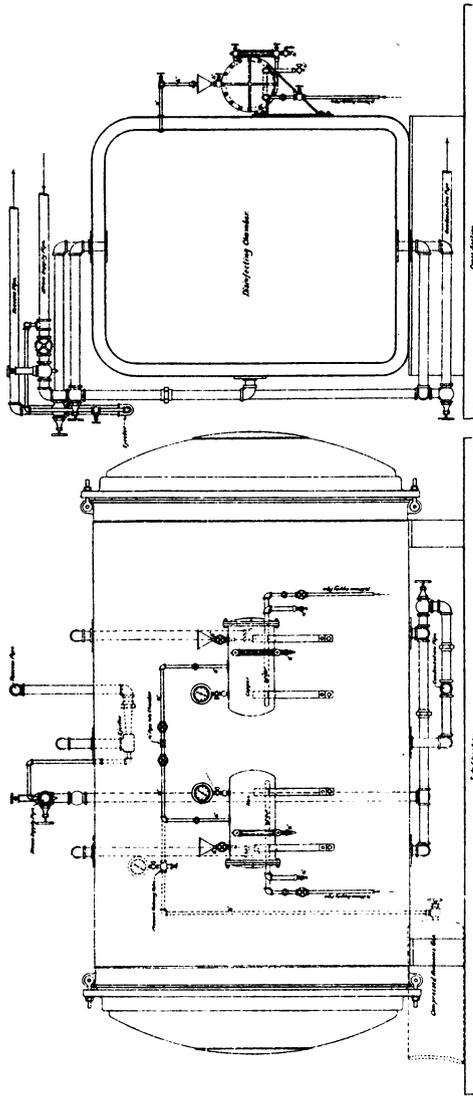
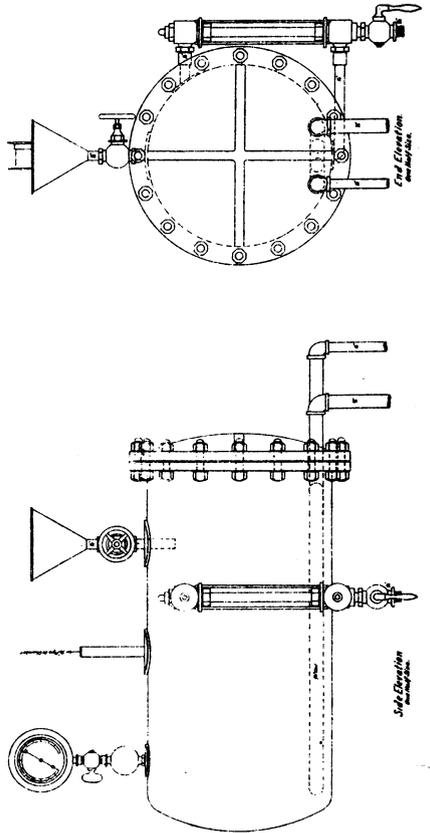


FIG. 2.



Small boiler for evolving formaldehyde gas from formalin, or formol.

of calcium chloride and formalin is prepared and poured into the copper boiler and steam allowed to course through the spiral heating coil, and continued until a pressure of from 75 to 90 pounds is obtained. The gas is then turned into the chamber. If the vacuum gauge still shows a vacuum, the process can be repeated until the pressure is zero.

In this way one can readily obtain any desired percentage of the gas, and the time of exposure be governed accordingly. After the articles have been subjected to the gas for a sufficient time, the vacuum process is again started and half the atmosphere removed. Ammonia water is poured into the iron boiler and heated by means of the steam coil. It can then be thrown into the chamber, after the same manner as the formalin. The ammonia should be in excess of the quantity of formaldehyde gas. After 10 to 15 minutes the process is completed. This process is especially adapted for disinfecting mattresses, pillows, blankets, upholstered furniture, heavy rugs, furs, and books, and the mails; also, for the very fine textile fabrics, especially costumes and the like.

The advantages of such an apparatus are obvious: (1) Certainty of penetration of the objects; (2) reducing the time of exposure to a minimum and increasing the capacity of the chamber; (3) the quantity of the gas can always be gauged; (4) little or no injury to fabrics; (5) economy over steam.

Such an attachment can be made to any of the steam disinfecting chambers now in use without interfering in any way with their usefulness for steam disinfection. If a special chamber for formaldehyde disinfection is desired, it is recommended that a single-walled chamber, circular in form, be substituted for the jacketed steam chambers. While both these processes answer the requirements for the disinfection of rooms and their contents, the use of the formalin boiler is rendered a rather expensive procedure on account of the present price of the formalin. All the formalin or formol now used is of foreign manufacture.

#### LAMPS FOR EVOLVING FORMALDEHYDE GAS FROM METHYL ALCOHOL.

Quite a number of writers have suggested the use of a lamp or some such apparatus for converting methyl alcohol into formaldehyde gas. Several lamps are now to be had for this purpose. As said before, these lamps and apparatus are constructed on the principles of the Von Hoffman or Trillat processes.

Some of the lamps, notably the Bartheil and one constructed by Adnet, are claimed to be efficient for disinfection of rooms. Professor Robinson, of Bowdoin College, has recently perfected a similar lamp, which he claims to be quite efficient. So, also, has Dr. de Schweinetz, of Washington.

The amount of formaldehyde produced by any of these lamps is not believed to be as great as is claimed for them—that is to say, that the amount of alcohol consumed does not represent in proportion the amount of formaldehyde. It is believed that only a part of the alcohol is changed; the rest is either converted into a higher state of oxidation or is volatilized by the heat.

If such a lamp will generate a sufficient quantity of formaldehyde gas for disinfection of a room, and it is meant by this simply a surface disinfection, it will be a great improvement over the present method. Sulphur gas has proven so inefficient that it is hardly worth considering.

It has been my purpose to study this subject in all its lights, with a hope that a simple apparatus could be devised by which surface disinfection could be reliably performed.

Lamps which contain free alcohol—that is, contain any considerable quantity in reservoirs, may, under certain unlooked-for conditions, ignite or explode.

This is a serious objection. A lamp to meet all requirements for room (surface) disinfection should be so constructed as to preclude any such accident.

I have recently devised several modifications of the lamps, and have had a lamp constructed which appears to better meet these objections.

While this lamp does not consume as much alcohol within a given time as is claimed for others, it combines safety, simplicity, cheapness, and efficiency.

My thanks are also due to the Coast and Geodetic Survey for many valuable suggestions, and for the preparation of the drawings and the building of experimental lamps.

The lamp, as shown in the accompanying illustration (Fig. 3), consists of three parts; a lamp bowl, a collar, containing converter, and a hood, and is constructed after the following manner:

The lamp bowl is made from a five-quart milk pan, and filled with ordinary mineral wool, such as is used for insulating pipe, etc.

The collar is made of sheet iron; the lower edge is made to fit closely over the shoulder of the lamp bowl, 8 inches above a number of perforations (92) for draught. Nine inches above a groove is turned on the collar, upon which lies a disk of platinized asbestos, supported by a number of cross wires. The collar is extended about 5 inches above this disk, and acts as a chimney. Just about a half inch above the top of the lamp bowl is inserted a disk of perforated tin. This acts as a damper or radiator, and prevents the undue volatilization of the alcohol by heat from the asbestos disk.

A hood is also provided, which fits closely over the top, and extending down below the draught holes. The efficiency of the lamp lies altogether in the character and construction of the platinized asbestos disk.

This is made of an extra hard pressed asbestos millboard,  $\frac{3}{8}$ -inch thick, and is perforated with  $\frac{1}{8}$ -inch holes one-half an inch apart.

The best asbestos for this purpose is furnished by the H. W. Zahn's Manufacturing Company of New York.

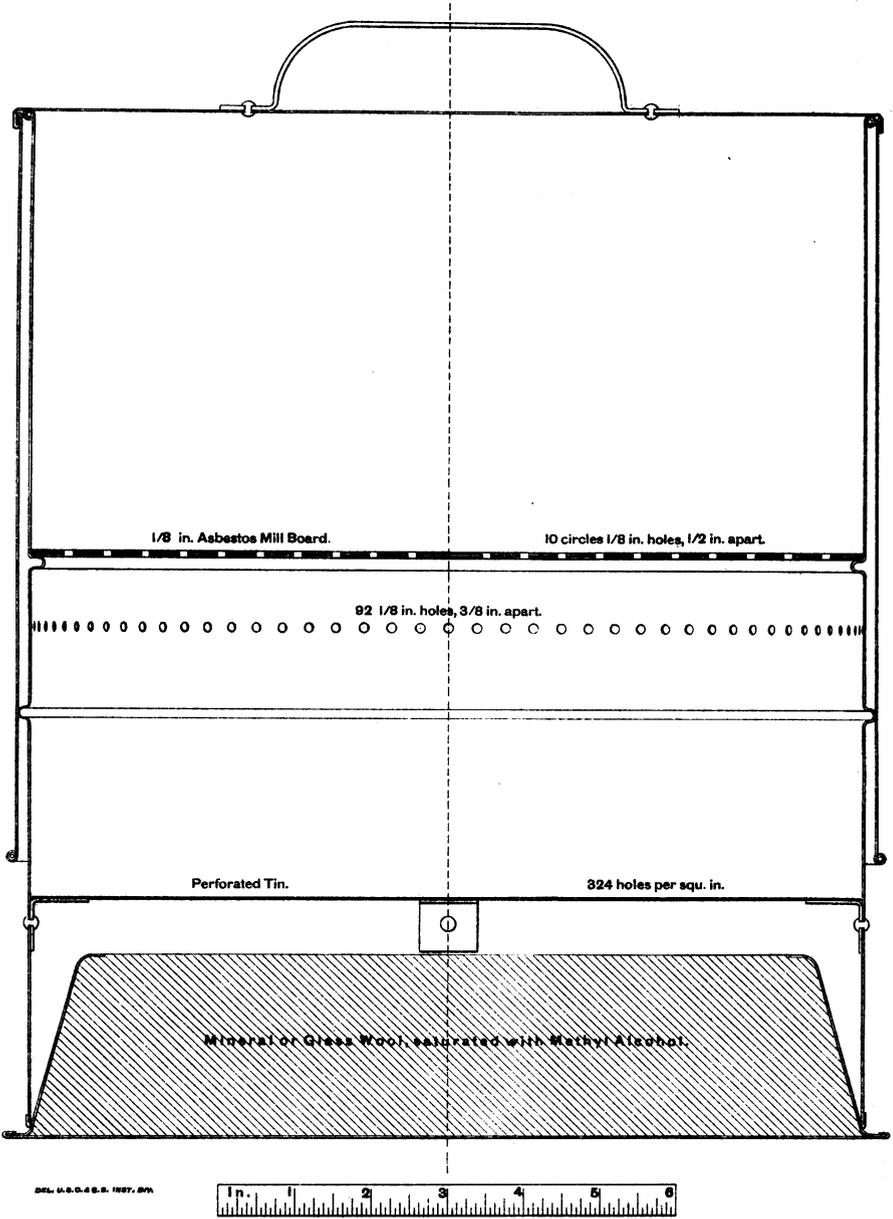
*Platinizing the disk.*—About 0.3 gram of platinic chloride is dissolved in 150 c. c. of alcohol or water. The disk is placed in a flat-bottomed vessel and the solution is then poured over it and allowed to thoroughly saturate it, after which it is placed in the iron collar and moulded in place. It is then ignited and the alcohol burned off. The perforated tin disk is removed and the collar placed over the lamp in the same position as if for heating it for disinfection. The alcohol is ignited and allowed to burn until the platinic chloride is converted into platinum black. It is then ready for use.

When the lamp is to be used, the collar is removed and the required amount of alcohol is poured over the mineral wool; this readily absorbs the alcohol and prevents any free alcohol from spilling should it be tipped over. It also prevents undue action of the flame should, by chance, it become ignited.

The collar is replaced over the lamp bowl so that one edge of the collar rests on the top of the lamp, and a half an inch or so of air space is around the bottom. The hood is removed and the alcohol lighted. The lamp is allowed to burn freely until the platinized disk of asbestos begins to glow slightly, when the hood is placed over the collar slowly, and then by means of the handle the collar is placed in proper position over the lamp bowl and pressed down so that the collar fits snugly.

After about 30 seconds remove the hood and observe whether the alcohol has ceased to burn. If not, replace the hood and again after 30 seconds remove, when the platinized disk should begin to glow and formaldehyde be given off. Sometimes, however, the lamp will ignite below at the draught holes and burn with a slight flame. This is caused by one of two things. First, the collar may not fit snugly around the lamp bowl; second, the perforated tin disk may have been heated too hot when the lamp was started. By placing the hood over the collar and waiting for about a minute this latter will be prevented.

It is intended that this lamp should be filled with the required amount of alcohol, placed in the apartment, started, and allowed to remain for the full time of exposure. The air of the apartment can be neutralized by ammonia fumes and then opened. The



Formaldehyde lamp. Cross section.

FIG. 3.

results obtained with this lamp have been quite satisfactory, especially with regard to disinfecting apartments infected with diphtheria.

I have not been able, however, at all times to disinfect the interior of pillows and mattresses with certainty, even when a very small room was used for this purpose and a large amount of methyl alcohol consumed. The surfaces, dust, etc., were every time rendered sterile.

#### QUANTITY OF ALCOHOL REQUIRED.

Not less than 500 c. c. of methyl alcohol should be used for each 1,000 cubic feet of space.

For disinfecting clothing and the light fabrics, it would be well to put them in as small a space as possible, and have the articles so arranged as to have all the surfaces freely exposed to the gas.

It is often required that a preliminary disinfection be given an infected apartment and contents before they are disturbed. This is, of course, a preliminary precaution which will, if properly performed, render the danger of dissemination of the infection less, by sterilizing the surfaces of the articles. Lamps could be used advantageously in such instances for the preliminary disinfection of the surfaces of such articles which it would be necessary to remove and treat by other processes. When this is done, the gas should be neutralized.

#### NEUTRALIZATION OF THE EXCESS OF FORMALDEHYDE GAS.

This is best accomplished by having a small tinned iron boiler, conical in shape, holding about three quarts, provided with a filling cock and tube on top. A rubber tube can be attached to this and fed into the apartment, through the door, preferably the keyhole. Ammonia water is poured into the boiler, stopcock closed, and then the boiler set in a bowl of boiling water. This will readily evolve the ammonia gas. A small kerosene lamp can be used instead of the boiling water.

#### TRIOXYMETHYLENE.

Reference has been previously made to the substance known as trioxymethylene, or "paraform." This substance is formed when a 40 per cent solution of the gas is concentrated. It gives off formaldehyde gas slowly at ordinary temperatures, and when heated it breaks up into formaldehyde and formic acid.

It has been suggested that this substance could be used as a disinfecting powder. Miquel has demonstrated that it possesses germicidal properties sufficient to kill anthrax spores, provided the exposure be prolonged. It might be of value in disinfecting the packed effects of persons and merchandise coming from places where an epidemic prevails. But just how long the articles must be subjected can not now be determined.

#### OTHER METHODS OF USING FORMALIN.

Formalin or formol can be used in other ways than in the foregoing, it is believed, with excellent results. Although our experiments are still under way, it may now be said that the infected articles, such as packed effects, can be rendered sterile by the application of one of these solutions. It may be applied to the articles by sprinkling, or by moistening some absorbent substance with these and placing it among the clothing. Due care should be exercised to see that the agent is well distributed among the contents of the package. The packed effects of immigrants, not to be used on the voyage, could be disinfected by subjecting them to an application of formaldehyde. This should be performed under the supervision of the proper officer. The packages could then be sealed and not opened until arrival on this side. This procedure would relieve the quarantine of an enormous work, and reduce the danger of importation of infectious diseases from this source to a minimum.

Articles exposed to the infection of smallpox, yellow fever, plague, and cholera could be thus disinfected.

#### MAILS AND BOOKS.

Should be disinfected by the use of a disinfecting chamber and the vacuum process. Bundles of letters and papers should always be untied. Individual letters can be readily disinfected by placing in the envelope a small piece of blotting paper moistened with formalin or formol.

For mails coming from infected districts the disinfection might be accomplished in a similar manner as is recommended for the packed effects of persons. The mail matter could be sprinkled with formaldehyde solutions or placed in contact with some absorbent substance, moistened with formalin, placed in the mailing bags and closed. If allowed to remain in contact with the gas for several days, say the ordinary time of an ocean voyage between Europe and this country, it is believed that they will be incapable of transmitting infection. It would be necessary to neutralize the formaldehyde gas before they could be handled.

#### DISINFECTION ON SHIPBOARD.

In case of infection on shipboard, especially yellow fever, where it becomes necessary to disinfect all the wearing apparel and upholstered work and hangings with the least possible delay, a small room may be improvised into a formaldehyde disinfectant after the following manner: Clothing that may possibly be injured by an excess of moisture can be protected by a cotton cloth. A layer of clothing is spread on the floor, then covered with a cotton cloth, then followed with cloth dipped into or sprinkled with formalin, and another cotton cloth, then another layer of clothing. The whole to be covered with a piece of tarpaulin and the edges weighted down. After an exposure of forty-eight hours the articles will be thoroughly disinfected. While this process is somewhat expensive it is much cheaper than buying new clothing or having them damaged by other methods.

Containers for clothing—packing cases for merchandise—can readily be disinfected by formaldehyde lamps. Care should be exercised, however, to use as small a space as possible, and have it tight.

#### DISINFECTION OF HOLDS OF VESSELS.

It would not be fair to say just how far formaldehyde gas will be applicable for this purpose. It may be possible, but in view of our experiments, it would appear that there are insuperable difficulties in the way of applying this agent in the presence of so much moisture, that it would answer at best as a surface disinfectant. This is, however, an opinion it may be possible to reverse when a series of experiments now under way is completed.

The lamps give off a large amount of water, which militates against the diffusion. Attempts have been made to dry the gas, but so far the drying agent either withholds the gas or breaks it up.

If it is found that the gas can be used for the disinfection of holds, it is believed that an apparatus designed on the principle of Trillat will give the best results. By this means as large a quantity as desired of the methyl alcohol can be consumed. It only depends upon the number of convertors. Experiments are now being made with such apparatus, with a view of determining the efficiency for disinfecting holds.

In conclusion, I would state that from the foregoing it would appear that this agent is destined to play no small part in our fight against infectious disease.

While it does not fill all the requirements of an ideal disinfectant, it is equal, if not superior, to any of our present methods.

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Recherches bacteriologiques sur valeur de la formaline. Arch. de Med. Expere-ment. Par., 1895.

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*Smallpox in Pensacola.*

PENSACOLA, FLA., January 20, 1897.

SIR: I reported to you yesterday 1 case of smallpox occurring in my private practice, and I am informed that 2 cases were sent to the pest-house on the same date by the health authorities. The disease, in my opinion, is increasing instead of decreasing.

Respectfully, yours,

J. WHITING HARGIS,  
Acting Assistant Surgeon, U. S. M. H. S.

*Smallpox in the United States as reported to the Supervising Surgeon-General United States Marine-Hospital Service, December 29, 1896, to January 23, 1897.\**

Places.	Date.	Cases.	Deaths.	Remarks.
Alabama:				
Mobile .....	Dec. 28 .....	1	.....	
Florida:				
Pensacola .....	Jan. 19 .....	5	.....	
Escambia County (not including Pensacola).	Dec. 2-Jan. 19 .....	18	.....	

\* For table of smallpox in the United States, etc., May 9, 1896, to December 29, 1896, see PUBLIC HEALTH REPORTS, Vol. XII, No. 1.

*Report of immigration at Boston for the week ended January 23, 1897.*

OFFICE OF U. S. COMMISSIONER OF IMMIGRATION,  
*Port of Boston, January 23, 1897.*

*Number of alien immigrants who arrived at this port during the week ended January 23, 1897; also names of vessels and ports from which they arrived.*

Date.	Vessel.	Where from.	No. of immigrants.
Jan. 17	Steamship Boston.....	Yarmouth, Nova Scotia.....	63
Jan. 19	Steamship Victorian.....	Liverpool, England.....	1
Do....	Steamship Barnstable.....	Port Morant, Jamaica.....	2
Jan. 21	Steamship Halifax.....	Halifax, Nova Scotia.....	10
Do....	Steamship Boston.....	Yarmouth, Nova Scotia.....	21
	<b>Total</b> .....		<b>97</b>

THOMAS F. DELHANTY,  
*Commissioner of Immigration.*

*Report of immigration at New York for the week ended January 23, 1897.*

OFFICE OF U. S. COMMISSIONER OF IMMIGRATION,  
*Port of New York, January 25, 1897.*

*Number of alien immigrants who arrived at this port during the week ended January 23, 1897; also names of vessels and ports from which they arrived.*

Date.	Vessel.	Where from.	No. of immigrants.
Jan. 17	Steamship Edam.....	Amsterdam.....	53
Do....	Steamship Servia.....	Liverpool and Queenstown.....	64
Do....	Steamship La Bourgogne.....	Havre.....	190
Jan. 18	Steamship Karlsruhe.....	Bremen.....	121
Jan. 19	Steamship Spaarndam.....	Rotterdam.....	97
Jan. 20	Steamship Noordland.....	Antwerp.....	57
Jan. 21	Steamship Teutonic.....	Liverpool and Queenstown.....	92
Do....	Steamship Galileo.....	Rio de Janeiro.....	3
Do....	Steamship Clive.....	Genoa and Naples.....	499
Jan. 22	Steamship Virginia.....	Stettin.....	67
Jan. 23	Steamship St. Louis.....	Southampton.....	55
Do....	Steamship Andalusia.....	Hamburg.....	102
Do....	Steamship Campania.....	Liverpool and Queenstown.....	111
Do....	Steamship Massilia.....	Marseilles and Naples.....	206
Do....	Steamship Buffon.....	Santos and Lucia.....	54
	<b>Total</b> .....		<b>1,771</b>

Dr. J. H. SENNER,  
*Commissioner of Immigration.*

*Report of immigration at Philadelphia for the week ended January 23, 1897.*OFFICE OF U. S. COMMISSIONER OF IMMIGRATION,  
*Port of Philadelphia, January 25, 1897.**Number of alien immigrants who arrived at this port during the week ended January 23, 1897;  
also names of vessels and ports from which they arrived.*

<b>Date.</b>	<b>Vessel.</b>	<b>Where from.</b>	<b>No. of im- migrants.</b>
Jan. 17...	Steamship Ethelred .....	Jamaica.....	1
Do.....	Steamship Waesland.....	Liverpool .....	22
Jan. 20...	Steamship Teviotdale.....	London .....	1
Jan. 21...	Steamship Nederland.....	Antwerp.....	64
	<b>Total</b> .....	.....	<b>88</b>

JNO. J. S. RODGERS,  
*Commissioner of Immigration.*

**QUARANTINE REPORTS.**  
*National quarantine stations.*

[Vessels named only when detained or given treatment at quarantine.]

Name of station.	Week ended.	Name of vessel.	Date of arrival.	Port of departure.	Destination.	Treatment of vessel, passengers, and cargo.	Date of departure.	Remarks.	Vessels inspected and passed.
Brunswick, Ga.	Jan. 16	Am. sc. A. D. Lamson.	Jan. 14	Kingston.	St. Simons.	Disinfected and held.	Jan. 16		1
Delaware Breakwater, Del.	Jan. 23							No transactions.	2
Eureka, Cal.	Jan. 18							No transactions.	15
Gulf, Ship Island, Miss.	Jan. 16							do	5
Grays Harbor, Wash.	Jan. 18								16
Newbern, N. C.	Jan. 16								4
Reedy Island, Del.	Jan. 23								
San Diego, Cal.	Jan. 16								
San Francisco, Cal.	do	Am. bk. Syra *	Jan. 6	Santos.	Savannah	Disinfected and held.	Jan. 15		1
South Atlantic, Blackheard Island, Ga.	do								
Southport, N. C.	Jan. 9	Am. sc. Chamption *	Jan. 1	Habana.	Key West	Disinfected.	Jan. 5		1
Tortugas, Key West, Fla.	Jan. 23	Am. sc. Wave *	Dec. 10	Key West.	do	Clothing and bedding steamed.	Jan. 9		
Washington, N. C.	Jan. 23							No transactions.	

\* Previously reported.

QUARANTINE REPORTS—Continued.  
 State and municipal quarantine stations.

[Vessels named only when detained or given treatment at quarantine.]

Name of station.	Week ended.	Name of vessel.	Date of arrival.	Port of departure.	Destination.	Treatment of vessel, passengers, and cargo.	Date of departure.	Remarks.	Vessels inspected and passed.
Boston, Mass.	Jan. 23								11
Charleston, S. C.	do.	Sp. bk. Conception	Jan. 20	Habana	Charleston	Disinfected and held	Jan. 23		2
Elizabeth River, Va.	do.								5
Galveston, Tex.	Jan. 16								10
	Jan. 23	Br. ss. Eden Hall	Jan. 19	Calcutta via Dundee.	Galveston	Fumigated for 6 hours	Jan. 19		10
Newport News, Va.	do.								5
Providence, R. I.	do.							No transactions	5

*Reports of States and yearly and monthly reports of cities.*

**CALIFORNIA.**—Month of December, 1896. Reports to the State board of health from 51 cities, towns, and villages having an aggregate population of 744,280, show a total of 1,075 deaths, including phthisis pulmonalis, 181; enteric fever, 23; diphtheria, 24; croup, 5; measles, 1, and whooping cough, 2.

*San Francisco.*—Month of December, 1896. Estimated population, 330,000. Total deaths, 603, including phthisis pulmonalis, 88; enteric fever, 9; diphtheria, 11; whooping cough, 1, and croup, 2.

**FLORIDA**—*Pensacola.*—Month of December, 1896. Estimated population, 15,000. Total deaths, 22, including 1 from croup.

**INDIANA**—*Evansville.*—Month of December, 1896. Estimated population, 65,000. Total deaths, 58, including phthisis pulmonalis, 12; enteric fever, 4; diphtheria, 3, and whooping cough, 1.

**KENTUCKY**—*Louisville.*—Month of December, 1896. Estimated population, 211,100. Total deaths, 293, including phthisis pulmonalis, 43; enteric fever, 7; scarlet fever, 1; diphtheria, 8, and croup, 4.

**MAINE**—*Portland.*—Four weeks ended December 26, 1896. Estimated population, 41,500. Total deaths, 57, including phthisis pulmonalis, 8; diphtheria, 7, and croup, 2.

**MASSACHUSETTS**—*Fitchburg.*—Month of December, 1896. Estimated population, 26,409. Total deaths, 40, including phthisis pulmonalis, 5; enteric fever, 1; diphtheria, 2; membranous croup, 2, and whooping cough, 1.

**MICHIGAN.**—Week ended January 16, 1897. Reports to the State board of health from 64 observers indicate that consumption and diarrhea increased in area of prevalence. Phthisis pulmonalis was reported present during the week at 209 places, diphtheria at 49, scarlet fever at 41, measles at 38, enteric fever at 28, and whooping cough at 21 places.

**NEW JERSEY**—*Paterson.*—Month of December, 1896. Estimated population, 78,358. Total deaths, 172, including phthisis pulmonalis, 28; enteric fever, 16; measles, 1, and croup, 4.

**MINNESOTA**—*Minneapolis.*—Month of December, 1896. Estimated population, 225,602. Total deaths, 158, including phthisis pulmonalis, 19; enteric fever, 2; diphtheria, 10, and whooping cough, 1.

**NEW YORK**—*Buffalo.*—Month of December, 1896. Estimated population, 350,000. Total deaths, 414, including phthisis pulmonalis, 40; enteric fever, 6; diphtheria, 41; croup, 15; scarlet fever, 3; measles, 4, and whooping cough, 7.

**OHIO**—*Columbus.*—Month of December, 1896. Estimated population, 100,000. Total deaths, 92, including phthisis pulmonalis, 23; enteric fever, 5, and diphtheria, 1.

**UTAH**—*Salt Lake City.*—Month of December, 1896. Estimated population, 70,000. Total deaths, 50, including phthisis pulmonalis, 3; enteric fever, 6, and scarlet fever, 1.

## MORTALITY TABLE, CITIES OF THE UNITED STATES.

Cities.	Week ended.	Population, U. S. Census of 1890.	Total deaths from all causes.	Deaths from—										
				Phthisis pulmonalis.	Yellow fever.	Smallpox.	Varicoid.	Cholera.	Typhus fever.	Enteric fever.	Scarlet fever.	Diphtheria.	Measles.	Whooping cough.
Altoona, Pa.....	Jan. 16.....	30,337	8									1		
Amesbury, Mass.....	Jan. 23.....	9,798	0											
Ashtabula, Ohio.....	.....do.....	8,338	0											
Baltimore, Md.....	.....do.....	434,439	172	20						2	1	13	1	1
Battle Creek, Mich.....	.....do.....	13,197	1											
Bennington, Vt.....	.....do.....	6,391	3											
Boston, Mass.....	.....do.....	448,477	200	23						4	3	8	1	
Bristol, R. I.....	Jan. 16.....	5,478	1											
Brockton, Mass.....	.....do.....	27,294	10									1	1	
Brooklyn, N. Y.....	Jan. 23.....	806,343	374	32							2	5	27	7
Brownsville, Tex.....	Jan. 2.....	6,134	5											
Do.....	Jan. 9.....	6,134	7											
Do.....	Jan. 16.....	6,134	2											
Butler, Pa.....	Jan. 23.....	8,734	5											
Cambridge, Mass.....	.....do.....	70,028	32	4								3	1	
Carlisle, Pa.....	.....do.....	7,628	0											
Charleston, S. C.....	Jan. 9.....	* 54,955	† 22	1										
Do.....	Jan. 16.....	* 54,955	† 49	1										
Chicago, Ill.....	.....do.....	1,099,850	451	42								7	2	18
Do.....	Jan. 23.....	1,099,850	434	45						10	1	11	2	2
Cincinnati, Ohio.....	Jan. 22.....	296,908	132	22						3	1	2		
Cleveland, Ohio.....	Jan. 23.....	261,353	89	4								2		3
Columbus, Ind.....	.....do.....	6,719	2							1				
Columbus, Ohio.....	.....do.....	88,150	23	5						3	2			
Concord, N. H.....	.....do.....	17,044	7											
Denver, Colo.....	Dec. 26.....	106,713	30	9									3	2
Do.....	Jan. 2.....	106,713	35	6						2			2	
Do.....	Jan. 9.....	106,713	41	11								1		
Dunkirk, N. Y.....	Jan. 23.....	9,416	2											
Emporia, Kans.....	Jan. 16.....	7,551	3	1										
Erie, Pa.....	.....do.....	40,634	13	1								1	1	
Everett, Mass.....	Jan. 23.....	11,068	9									1	1	
Fall River, Mass.....	.....do.....	74,398	36	2						1				
Flint, Mich.....	.....do.....	9,803	3											
Gloucester, Mass.....	Jan. 16.....	24,651	4											
Grand Rapids, Mich.....	.....do.....	60,278	18	4						2				
Do.....	Jan. 23.....	60,278	16	1										
Haverhill, Mass.....	.....do.....	27,412	14	1										
Ironton, Ohio.....	.....do.....	10,939	4											
Jacksonville, Fla.....	.....do.....	17,201	13	4										
Jersey City, N. J.....	Jan. 17.....	163,003	71	9								6		1
Kalamazoo, Mich.....	Jan. 9.....	17,853	8											
Do.....	Jan. 16.....	17,853	6											
Lowell, Mass.....	Jan. 23.....	77,296	32	5						1		1	1	1
Lynchburg, Va.....	.....do.....	19,709	14	3										
McKeesport, Pa.....	Jan. 16.....	20,741	9											
Manchester, N. H.....	.....do.....	44,126	30	2								1		1
Do.....	Jan. 23.....	44,126	20	2									1	
Medford, Mass.....	.....do.....	11,079	7											
Melrose, Mass.....	Jan. 16.....	8,519	4											1
Memphis, Tenn.....	Jan. 23.....	64,495	24	6								1		
Michigan City, Ind.....	Jan. 16.....	10,776	1											
Milwaukee, Wis.....	Jan. 23.....	204,468	79	2						4		5	3	
Minneapolis, Minn.....	Jan. 16.....	164,738	45	5								1		
Mobile, Ala.....	Jan. 12.....	31,076	20	3										
Nashville, Tenn.....	Jan. 23.....	76,168	.....	2										
New Bedford, Mass.....	.....do.....	40,733	15											
Newburyport, Mass.....	Jan. 16.....	13,947	3											
New Haven, Conn.....	Jan. 21.....	81,298	35							1		3		
Newport, R. I.....	Jan. 23.....	19,457	4											
New York, N. Y.....	.....do.....	1,515,301	703	77						6	13	28	5	4
Norristown, Pa.....	.....do.....	19,791	9	1										1
North Adams, Mass.....	.....do.....	16,074	2											
Oneonta, N. Y.....	.....do.....	6,272	5									1		
Palmer, Mass.....	.....do.....	6,520	3	1										
Petersburg, Va.....	Jan. 24.....	22,680	8											
Philadelphia, Pa.....	Jan. 16.....	1,046,964	510	64						11	4	28	3	5
Do.....	Jan. 23.....	1,046,964	448	42						5		32		4
Pittsfield, Mass.....	.....do.....	17,281	5									1		
Portland, Me.....	Jan. 16.....	36,425	14	2								1		
Pottstown, Pa.....	.....do.....	13,284	6							1	2			

\* Estimated population, 65,165—white, 28,870; colored, 36,295. † White, 8; colored, 14.  
‡ White, 12; colored, 37.



Table of temperature and rainfall, week ended January 18, 1897.

[Received from Department of Agriculture, Weather Bureau.]

Locality.	Temperature in degrees Fahrenheit.			Rainfall in inches and hundredths.		
	Normal.	*Excess.	*Defic'ncy.	Normal.	Excess.	Deficiency.
<b>Atlantic Coast:</b>						
Eastport, Me.....	20		2	.91	.29	
Portland, Me.....	20	2		.84		.51
Northfield, Vt.....	15	0		.70		.45
Boston, Mass.....	26	2		.97		.72
Vineyard Haven, Mass.....	34		2	.72		.24
Nantucket, Mass.....	29	1		.84		.52
Woods Hole, Mass.....	30		1	.84		.41
Block Island, R. I.....	30	0		.95		.60
New Haven, Conn.....	26	1		.98		.82
Albany, N. Y.....	24	0		.63		.60
New York, N. Y.....	30	0		.91		.77
Harrisburg, Pa.....	30		1	.84		.49
Philadelphia, Pa.....	31	1		.77		.31
New Brunswick, N. J.....	31		1	1.13		.80
Atlantic City, N. J.....	32	1		.84		.71
Baltimore, Md.....	34		2	.72		.27
Washington, D. C.....	32		1	.77		.55
Lynchburg, Va.....	38	5		.89		.39
Cape Henry, Va.....	40	1		.98		.60
Norfolk, Va.....	40		2	.84		.25
Charlotte, N. C.....	41		4	1.17		.08
Raleigh, N. C.....	42		5	.80	.13	
Kittyhawk, N. C.....	42	1	1	1.26		.88
Hatteras, N. C.....	46	1	1	1.40		.43
Wilmington, N. C.....	48		3	.91	.12	
Columbia, S. C.....	46		4	.84	.76	
Charleston, S. C.....	50	1		.91		.57
Augusta, Ga.....	47	0		1.05	1.59	
Savannah, Ga.....	52	0		.74	.24	
Jacksonville, Fla.....	56	2		.74		.74
Jupiter, Fla.....	67		1	.80		.80
Key West, Fla.....	71		1	.49		.49
<b>Gulf States:</b>						
Atlanta, Ga.....	41	3		1.45	.50	
Tampa, Fla.....	57	7		.56		.52
Pensacola, Fla.....	52	7		1.09		1.01
Mobile, Ala.....	50	7		1.22		.81
Montgomery, Ala.....	47	5		1.19	.09	
Vicksburg, Miss.....	44	11		1.31	.98	
New Orleans, La.....	53	8		1.19		.98
Shreveport, La.....	43	11		1.05	.39	
Fort Smith, Ark.....	35	10		.43	.27	
Little Rock, Ark.....	39	8		1.10	1.18	
Palestine, Tex.....	42	14		1.04	.66	
Galveston, Tex.....	51	11		.84		.56
San Antonio, Tex.....	51	10		.35		.32
Corpus Christi, Tex.....	54	11		.66		.61
<b>Ohio Valley and Tennessee:</b>						
Memphis, Tenn.....	36	10		1.26	.76	
Nashville, Tenn.....	36	6		1.15	.60	
Chattanooga, Tenn.....	40	4		1.58		.11
Knoxville, Tenn.....	37	3		1.26	.68	
Louisville, Ky.....	32	7		.91	.58	
Indianapolis, Ind.....	26	6		.63	.51	
Cincinnati, Ohio.....	32	4		.77	.15	
Columbus, Ohio.....	27	5		.72		.32
Parkersburg, W. Va.....	32	2		.70		.05
Pittsburg, Pa.....	30	3		.73		.43
<b>Lake Region:</b>						
Oswego, N. Y.....	22		2	.70		.61
Rochester, N. Y.....	23	0		.71		.51
Buffalo, N. Y.....	23	1		.64		.39
Erie, Pa.....	24			.77		
Cleveland, Ohio.....	25	4		.56		.24
Sandusky, Ohio.....	25	5		.49		.33
Toledo, Ohio.....	24	5		.43		.20
Detroit, Mich.....	24	3		.42		.01
Lansing, Mich.....	22	4		.42	.05	
Port Huron, Mich.....	20	4		.43	.30	
Alpena, Mich.....	16	6		.56		.44
Sault Ste. Marie, Mich.....	15	2		.42	.27	
Marquette, Mich.....	13			.47		
Green Bay, Wis.....	13	11		.50		.08

\*The figures in these columns represent the average daily departure.

Table of temperature and rainfall, week ended January 18, 1897—Continued.

Locality.	Temperature in degrees Fahrenheit.			Rainfall in inches and hundredths.		
	Normal.	*Excess.	*Defic'ncy.	Normal.	Excess.	Deficiency.
<b>Lake Region—Continued.</b>						
Grand Haven, Mich.....	23	3		.63	1.29	
Milwaukee, Wis.....	18	10		.49	.80	
Chicago, Ill.....	24	5		.47	.50	
Duluth, Minn.....	8	6		.24	.17	
<b>Upper Mississippi Valley:</b>						
St. Paul, Minn.....	8	6		.21	.53	
La Crosse, Wis.....	11	11		.28	.61	
Dubuque, Iowa.....	14	10		.37	.37	
Davenport, Iowa.....	18	10		.36	.72	
Des Moines, Iowa.....	14	12		.28	.28	
Keokuk, Iowa.....	20	11		.35	.69	
Springfield, Ill.....	25	7		.38	.79	
Cairo, Ill.....	32	8		.84	.82	
St. Louis, Mo.....	29	7		.48	.32	
<b>Missouri Valley:</b>						
Columbia, Mo.....	30	6		.42	.85	
Springfield, Mo.....	28	10		.49	.01	
Kansas City, Mo.....	24	11		.22	.34	
Wichita, Kans.....	25	14		.21	.12	
Concordia, Kans.....	18	16		.19	.01	
Lincoln, Nebr.....	16	15		.14	.07	
Omaha, Nebr.....	15	12		.14	.33	
Sioux City, Iowa.....	15	8		.21	.51	
Yankton, S. Dak.....	12	8		.14	.51	
Valentine, Nebr.....	11	12		.14	.50	
Huron, S. Dak.....	1	11		.07	.72	
Pierre, S. Dak.....	5	13		.14	.91	
Moorhead, Minn.....	3	6		.14	.14	
Bismarck, N. Dak.....	1	10		.14		.02
Williston, N. Dak.....	1	10		.14		.10
<b>Rocky Mountain Region:</b>						
Havre, Mont.....	2	20		.21		.19
Helena, Mont.....	13	12		.35		.33
Miles City, Mont.....	8	13		.14		.11
Rapid City, S. Dak.....	17	7		.07	.41	
Spokane, Wash.....	18	9		.56		.41
Wallawalla, Wash.....	29	0		.58		.33
Baker City, Oreg.....	22	1		.35		.25
Winnemucca, Nev.....	26	4		.28		.13
Salt Lake City, Utah.....	25	3		.35	.31	
Lander, Wyo.....	12	5		.21		.14
Cheyenne, Wyo.....	22	7		.07	.00	
North Platte, Nebr.....	14	16		.12	.04	
Denver, Colo.....	24	10		.14		.14
Pueblo, Colo.....	25	9		.07		.07
Dodge City, Kans.....	20	17		.07		.07
Oklahoma City, Okla.....	30	12		.44		.25
Amarillo, Tex.....	37	0		.11		.11
Abilene, Tex.....	39	11		.15	.48	
Santa Fe, N. Mex.....	27	4		.12	.31	
El Paso, Tex.....	44	4		.14	.10	
Phoenix, Ariz.....	48	4		.14	1.51	
<b>Pacific Coast:</b>						
Port Angeles, Wash.....	35			1.29		
Fort Canby, Wash.....	40			1.94		
Astoria, Oreg.....	42		3	1.99		.35
Portland, Oreg.....	37	0		1.61		1.06
Roseburg, Oreg.....	40		1	1.40		1.01
Eureka, Cal.....	45			1.96		
Red Bluff, Cal.....	44	0		1.05		.45
Carson City, Nev.....	31		1	.63		.04
Sacramento, Cal.....	44		1	.84		.14
San Francisco, Cal.....	49		2	1.05		1.01
Fresno, Cal.....	43	3		.28	.51	
Los Angeles, Cal.....	53		2	.58	3.38	
San Diego, Cal.....	53	2		.45	2.24	
Yuma, Ariz.....	53	0		.07	2.35	

\*The figures in these columns represent the average daily departure.

## FOREIGN.

[Reports received from United States consuls through the Department of State and from other sources.]

*Cholera, yellow fever, and plague as reported to the Supervising Surgeon-General United States Marine-Hospital Service, December 29, 1896, to January 28, 1897.\**

## CHOLERA.

Places.	Date.	Cases.	Deaths.	Remarks.
India:				
Bombay.....	Dec. 8-Dec. 15.....		1	
Calcutta.....	Nov. 14-Dec. 12.....		82	
Madras.....	Nov. 21-Nov. 27.....		2	
	Nov. 28-Dec. 4.....		1	
Ceylon:				
Colombo.....	Nov. 28-Dec. 12.....		41	
Japan:				
Tokyo.....	Dec. 4-Dec. 29.....	8	2	
Yokohama.....	Dec. 4-Dec. 29.....	4	1	

## YELLOW FEVER.

Brazil:				
Para.....	Dec. 12-Jan. 2.....		9	
Rio de Janeiro.....	Nov. 21-Dec. 26.....		10	
Cuba:				
Cardenas.....	Dec. 25-Jan. 16.....	50	6	
Cienfuegos.....	Dec. 20-Dec. 27.....		8	
	Dec. 28-Jan. 17.....		2	
Habana.....	Dec. 24-Dec. 31.....	90	33	
	Jan. 1-Jan. 14.....	270	96	
Matanzas.....	Dec. 9-Dec. 23.....		8	
	Dec. 23-Jan. 20.....		17	
Santiago.....	Dec. 5-Dec. 12.....		6	
	Dec. 26-Jan. 16.....		11	
Sagua la Grande.....	Dec. 19-Dec. 26.....	50	5	
	Dec. 26-Jan. 9.....	65	6	
Ecuador:				
Guayaquil.....	Dec. 18-Dec. 25.....		9	
Hayti:				
Port au Prince.....	Dec. 14.....			Yellow fever epidemic.

## PLAGUE.

India:				
Bombay.....	Dec. 1-Dec. 22.....		558	This is the number of deaths officially reported. The United States consul estimates the number of deaths for the same period at 2,648.
China:				
Hongkong.....	Dec. 13-Dec. 29.....			A few cases.
Japan:				
Formosa.....	Dec. 4-Dec. 29.....		15	

\* For table of cholera and yellow fever, as reported to the Supervising Surgeon-General United States Marine-Hospital Service December 26, 1895-December 29, 1896, see PUBLIC HEALTH REPORTS, Vol. XII, No. 1.

*Cholera and plague.*

[Translated in this Bureau from the "Veröffentlichungen des Kaiserlichen Gesundheitsamtes," Berlin, December 23 and 31, 1896.]

## CHOLERA.

BRITISH INDIA—*Calcutta*.—From October 25 to November 7 there were 7 deaths from cholera; from November 8 to 21, 16 deaths.

## PLAGUE.

BRITISH INDIA.—According to recent advices, the daily number of cases and deaths reported is from 10 to 20. No increase or diminution of the epidemic is observed.

JAPAN.—In North Formosa, from October 28 to November 5, 57 cases and 24 deaths were reported. Of these, the greater number occurred in the capital city, Taipehfu.

*Current quarantine measures.*

[Translated in this Bureau from the "Veröffentlichungen des Kaiserlichen Gesundheitsamtes," Berlin, December 23 and 31, 1896.]

PERSIA.—Advices of November 14 state that a quarantine of observation is prescribed at South Persian ports for all suspected vessels, counting from the date of departure from the last Indian port at which the vessel may have touched, and for suspected vessels isolation of the sick on an island, and five days' quarantine in addition to the eight days' quarantine of observation.

EGYPT.—According to advices of December 4 the international sanitary council has ordered that in the case of clean vessels arriving from Bombay and passing through the Suez Canal, the disinfection prescribed by article 1 of the regulations against plague shall be replaced by the sealing of such portions of the vessel as contain so-called susceptible wares. These compartments of the said vessels shall remain sealed so long as the vessels remain in Egyptian waters.

JAPAN.—By order of the Government, dated November 24, quarantine of observation is ordered for vessels arriving from Formosa and the Pescadores Islands.

## YELLOW FEVER.

PORTUGAL.—By public proclamation of the ministry the port of Bahia is declared infected, and all other ports of the province of that name are declared suspect.

DANISH ANTILLES.—According to advices of December 18 five days' quarantine is declared for all vessels arriving from Port au Prince, in the island of Haiti.

## SMALLPOX.

DANISH ANTILLES.—According to advices of December 18 quarantine of observation is ordered for all vessels arriving from ports of Haiti other than Port au Prince.

## BRAZIL.

*Sanitary report from Rio de Janeiro.*RIO DE JANEIRO, *December 28, 1896.*

SIR: I have the honor to transmit report for the week ended December 26, 1896:

There were 4 deaths from *accessio pernicioso*, a decrease of 18; 5 from yellow fever, an increase of 4; 1 from smallpox, the same as in the foregoing week; 1 from beriberi, a decrease of 7; 2 from enteric fever, a decrease of 1; 47 from tuberculosis, a decrease of 10; none from measles, 2 in the foregoing week, and 275 from all causes, a decrease of 34.

This is an excellent showing for the end of December, with the high temperature prevailing, and should we have rain soon the season promises well.

Smallpox may be considered as extinct in the interior, though a few sporadic cases occur.

Since last report the following-named ships have been visited, or received bills of health from this office: December 21, steamship *Capua*, German, for New York. December 22, steamship *Endeavour*, British, for Galveston, Tex., and steamship *Lucina*, British, for New Orleans, La. December 23, steamship *Rosse*, British, for New York, N. Y.; bark *Berwickshire*, British, for New York, N. Y., and bark *Antwerp*, Norwegian, for Pascagoula, Miss. December 24, steamship *Eastern Prince*, British, for New York, N. Y., and bark *Earl Derby*, British, for New York, N. Y. December 28, bark *Antioch*, American, for Barbados, West Indies.

Respectfully, yours,

R. CLEARY, M. D.,  
*Sanitary Inspector, U. S. M. H. S.*

## CUBA.

*Smallpox and yellow fever in Cuban seaports.*

Under date of January 19 the United States consul at Cardenas reports that during the week ended January 16 there was in that city 1 death from yellow fever.

Under date of January 16 the United States sanitary inspector at Santiago reports that during the week ended January 16 there were 5 deaths from yellow fever.

The United States sanitary inspector at Habana reports 80 new cases and 29 deaths from yellow fever and 110 deaths from smallpox during the week ended January 21.

Under date of January 22 the United States consul at Matanzas reports 9 deaths from yellow fever during the 2 weeks ended January 20.

SANTIAGO DE CUBA, *January 16, 1897.*

SIR: I have the honor of submitting the following report on the sanitary condition of Santiago de Cuba for the week ended January 16:

Seventy-one deaths have been reported, of which 5 were from yellow fever, 2 from smallpox, 4 from dysentery, 3 from pernicious fever, 6

from tuberculosis, 2 from remittent fever, 8 from diarrhea, and the rest from common diseases of noncontagious character.

There are some new cases of smallpox and I am afraid the epidemic will visit us again, as no precautions are taken now against this terrible malady. Vaccination has been done away with completely.

Yellow fever still prevails among the military element of our population, and as new men constantly arrive, there is always ready material for the insatiable disease.

Dysentery is very common amongst the poorer classes, while diarrhea has taken hold of the infantile population. Malarial fevers of bad character abound, the remittent fever being the most prevalent.

Respectfully, yours,

H. S. CAMINEBO, M. D.,  
*Sanitary Inspector, U. S. M. H. S.*

HABANA, CUBA, *January 23, 1897.*

SIR: By the following mortuary report, which I have the honor of forwarding you on this date, it will be seen that smallpox and yellow fever have diminished somewhat, though they are still active epidemics. As a considerable portion of the Spanish army is moving east from here, there will naturally be fewer cases of yellow fever in the military hospitals in and around this city. If vaccination is actually being practiced to the extent reported, we shall soon have a marked diminution of smallpox.

*Mortuary report.*—During the week ended January 21 there were 318 deaths in all in this city, 29 of which were caused by yellow fever, with 80 new cases approximately; 110 were caused by smallpox, with approximately 1,010 new cases; 16 were caused by enteric fever, 8 by so-called pernicious fever, 7 by paludal fever, 14 by dysentery, 19 by enteritis, 2 by diphtheria, 1 by the grippe, 7 by pneumonia, and 39 by tuberculosis.

All of the 29 deaths from yellow fever during the week were among Spanish soldiers in the military hospitals, and 1 of the deaths from smallpox. The remaining 109 deaths from smallpox occurred among civilians, and in every part of the city.

Very respectfully, your obedient servant,

D. M. BURGESS,  
*Sanitary Inspector, U. S. M. H. S.*

*Relative to precautions against introduction of infectious disease from Habana.*

HABANA, CUBA, *January 18, 1897.*

SIR: In answer to your communication of the 8th instant, requesting a statement as to whether the same steps to protect the country from the introduction of yellow fever and smallpox, taken during the past quarantine season, are still in force, I would reply that they are, in reference to smallpox, and possibly with even more rigor; with reference to yellow fever, the inspection of passengers and baggage, and labeling the latter, is performed for Florida ports, and the same steps are still taken in regard to New York, as requested by the health officer.

Very respectfully,

D. M. BURGESS,  
*Sanitary Inspector, U. S. M. H. S.*

## GERMANY.

*Report on tetanus antitoxin.*

FRANKFORT, November 16, 1896.

One by one the diseases which have hitherto defied the skill of physicians are yielding to the persistent attack of modern science. Since the successful treatment of diphtheria by subcutaneous injections of antitoxic serum was demonstrated—hardly three years ago—it has been confidently predicted that sooner or later all diseases which result from the action of a poison secreted in the blood by a special and characteristic bacillus would be conquered by similar means.

From the evidence now presented it would appear that tetanus, one of the most sinister and stubborn of human maladies, if not already conquered, is in a fair way to be successfully overcome. In the *Deutsche Medicinische Wochenschrift* (Berlin) for October 23 appears a joint announcement by Prof. Dr. von Behring, of diphtheria-antitoxin fame, and Professor Knorr, of Marburg, describing the qualities and best methods of using the new tetanus antitoxin, which is now prepared under Government supervision as a commercial product by the *Farbwerke* at Hoechst-on-Main, and offered for use by medical practitioners under the same conditions as diphtheria antitoxin from the same source.

Tetanus, as is well known, is an exceedingly painful and hitherto usually fatal disease caused by blood poisoning, generally the result of a wound. It is believed by physicians to be caused by the introduction into the system of a minute organism which rises from the ground in certain localities, so that the prevalence of tetanus varies greatly even in different districts of the same country. At all events, the disease has its characteristic microbe, which has been recognized, isolated, described, and reproduced by artificial culture. The distinctive symptom of tetanus is a persistent spasm of the voluntary muscles, aggravated by light, noise, or other disturbing influence to which the patient may be subjected. These spasms may affect any muscular portion of the body, but when, as is often the case, the maxillary muscles are principally attacked, the resulting malady is known as lockjaw.

The tetanus antitoxin described by Professor Behring and Dr. Knorr is similar in nature, action, and in the methods of its preparation to the antitoxin of diphtheria. It is prepared and put up for use in two forms, viz, as a dry powder, which is used for the treatment of developed cases of tetanus in men and animals, and as a liquid solution, which is employed for prophylactic purposes. Its strength or degree of efficiency is measured, like that of antidiphtheritic serum, by antitoxic units. The dry antitoxin is designated as a hundredfold normal antitoxin—that is, 1 gram of the preparation contains 100 units of antitoxic power; in other words, is sufficient to neutralize 100 grams of the normal poison of tetanus. It is put up for commerce in vials containing 5 grams each, and the contents of one such vial are theoretically sufficient for the cure of a developed case of tetanus. It is dissolved in 50 cubic centimeters of sterilized water at a temperature of 40° C. and injected hypodermically at a single dose. In the treatment of horses, the injection is made into a vein, by which the full action of the antitoxin is accelerated by about twenty-four hours, and this method of injection may even be employed with human patients in very severe cases or where the treatment is commenced at a late and perilous stage of the disease. To insure favorable results, the injection should be made, if possible, within thirty-six hours after the presence of tetanus is definitely indicated. The liquid solution is protected from contamination by germs in the atmosphere by a small admixture of phenol. The dry preparation, on the other hand, requires no such antiseptic while in that form, but when dissolved in water it becomes subject to deterioration, which may be prevented by the addition of 1 per cent of chloroform.

The tetanus solution is of fivefold strength, that is, 1 gram of the liquid contains five antitoxic units, and in this form it is put up in sealed 5-gram vials. In presence of wounds which give reason to fear lockjaw or other form of tetanus, a small subcutaneous injection of the solution is made, the quantity used being proportionate to the condition of the patient and the time that has elapsed since the injury was received. In all cases, the wound should be antiseptically treated, so as to prevent as far as possible the further generation of poison in the blood.

Tetanus is a disease of seldom occurrence in this section of Germany, and opportunities to test the remedy in actual practice are comparatively rare. One such case has been recently treated at the Hospital of the Holy Spirit, in Frankfort, the record of which is officially and minutely given.

On the 19th of September last, a coppersmith (L. M.), 25 years of age and resident in

Frankfort, experienced after exposure to thorough wetting severe pains and stiffness in the muscles of the neck and throat. Two days after the first symptoms appeared he came under treatment by a physician, who kept the patient in bed and administered chloral and salicylate of soda. The symptoms of tetanus continued to develop, and on the night of the 29th of September became so marked and violent that on the following day the patient was transferred to the hospital. A careful examination revealed a small cut or scratch under the right ear, then nearly healed, and so slight in outward appearance that it had passed almost unnoticed. At the time of admission to the hospital the patient was growing rapidly worse. The chin was twisted far to the left, the head drawn backward and immovable, and the muscles of the body, especially the back and abdomen, were hard and tensely drawn. The patient was isolated in a dark room and treated with subcutaneous injections of morphine, which gave no relief. The slightest noise or disturbance, such as the entrance of the physician or nurse into the darkened room, induced severe spasms, and the condition of the sufferer continued to grow steadily worse. At 4 o'clock in the afternoon of October 1 a prolonged spasm of intense severity left no further doubt of a fully developed case of tetanus, and half an hour later 5 grams of the hundred-unit antitoxin, dissolved in 50 grams of water, were injected hypodermically at three places on the breast.

During the evening of the same day, a slight but definite improvement was observed, and this continued throughout the following day, the spasms being fewer and of shorter duration than before the antitoxin had been administered. This condition was maintained from the 3d to the 6th of October, when the acute symptoms gradually returned and by 9 o'clock in the evening became so severe that a second dose of 4 grams of normal antitoxin was administered as before, with the result that before the next morning the muscles began to relax, the spasms became lighter and less frequent, and from that time improvement was so rapid and sustained that on the 23d of October, sixteen days after the second injection of antitoxin, the patient was convalescent, and, at his own request, was discharged from the hospital.

This, in the opinion of the physicians in charge, was a typical and conclusive case, in which life could not have been saved by any other treatment previously known, and in which the course of the disease might unquestionably have been arrested and greatly shortened had the antitoxin been used when the patient first came under medical treatment instead of ten days later, when the case had become one of acute and fully developed tetanus.

It is, of course, too soon to estimate the exact prophylactic or therapeutic value of the new remedy. That can only be determined by a long series of observations in actual practice, which will be made as rapidly as the comparative rarity of the disease itself will permit. Thus far the antitoxin has been used experimentally, both in this country and in France, with horses, cattle, guinea pigs, mice, etc., and from these tests, and the hospital case above described, the indications are that its use entails no injurious result. The antitoxin is prepared with extreme care, subjected to rigid inspection and control at the imperial testing laboratory at Steglitz, and with this guaranty is placed within reach of bacteriologists and medical practitioners in all countries.

FRANK H. MASON,  
*United States Consul-General.*

INDIA.

*Report on the prevalence of bubonic fever (plague) in Bombay.*

BOMBAY, December 24, 1896.

SIR: The exodus of natives from the city still continues and business in the native town is almost at a standstill.

Population last census.....	821, 764
Total number of deaths for corresponding week last year.....	450
Mean number of deaths per week from all causes, previous five years .....	470
Present population (estimated 250,000 have left city).....	571, 764
Proportionate number of deaths based on number for previous five years.....	327
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Total number of deaths reported for week ended December 22, 1896.. .....	1, 416
Deduct, as above, for average previous five years.... ..	327
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Number of deaths last week that may be attributed to plague.....	1, 089

Estimated average number of deaths per day from plague for week ended December 22, 1896.....	155
Total number of deaths from plague officially reported for last week.....	226
Average per day officially reported.....	32

S. COMFORT,  
*United States Consul.*

JAPAN.

*Report of the prevalence of infectious diseases.*

YOKOHAMA, *December 30, 1896.*

SIR: I have the honor to inclose herewith my regular report on infectious diseases in Japan for period December 13 to December 29, inclusive.

In view of the great prevalence, wide distribution, and malignant type of the smallpox now epidemic, I have, after consultation with the United States consul-general, considered it necessary to enforce disinfection, as well as vaccination, with regard to all steerage passengers from or through infected districts, the passport system of Japan enabling me to determine, with certainty, the last residence of the applicant for passage.

I may add that I have undoubtedly correct information of the recent occurrence of a few cases of plague in Hongkong after a considerable interval of freedom from this disease.

I am, sir, very respectfully, your obedient servant,  
STUART ELDRIDGE, M. D.,  
*Sanitary Inspector, U. S. M. H. S.*

[Inclosure.]

*Report of infectious diseases in Japan from December 13 to December 29, 1896.*

Locality.	Cholera.		Dysentery.		Smallpox.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Kioto Fu.....			4	6	68	15
Osaka Fu.....			8	1	162	37
Tokyo Fu.....	2	2	13	(*)	689	(*)
Aichi Ken.....			13	9	1	
Akita Ken.....			3	8		
Awomori Ken.....			10	6	2	
Chiba Ken.....			9	3	14	3
Fukui Ken.....			3	1	2	
Fukuoka Ken.....			1	4	51	15
Fukushima Ken.....			1			
Gifu Ken.....			85	106		
Gumma Ken.....			30	16		
Hiogo Ken.....			42	23	284	133
Hiroshima Ken.....			32	21	53	18
Ibaraki Ken.....			98	13	10	1
Ishikawa Ken.....					2	
Iwate Ken.....			3	7	2	1
Kagawa Ken.....			7	5	2	1
Kagoshima Ken.....			33	12		
Kanagawa Ken (Yokohama).....	2	1	26	6	14	2
Kochi Ken.....			21	8	21	4
Kumamoto Ken.....						
Miyagi Ken.....			7	3	30	10
Miyazaki Ken.....			6	1		
Miye Ken.....			14	8		
Nagano Ken.....			10	5	1	
Nagasaki Ken.....			21	6		
Nara Ken.....			1	4	2	
Niigata Ken.....						
Osaka Ken.....						
Oyama Ken.....			7	4	16	6
Okinawa Ken.....					63	27
Saga Ken.....			1	1	12	1
Saitama Ken.....			73	32	53	16
Shizuoka Ken.....			136	61		
Shiga Ken.....			2		4	2
Shimane Ken.....			9	5		
Tochigi Ken.....						
Tokushima Ken.....			11	4	50	13
Tottori Ken.....						
Toyama Ken.....					1	
Wakayama Ken.....						
Yamagata Ken.....			1	4		
Yamaguchi Ken.....			22	13	29	5
Yamanashi Ken.....			23	11	1	
Yehime Ken.....						
The Hokkaido.....			1	3	6	
Taiwan (Formosa).....	†9	†7				
Totals.....			787	420	1,640	309

\* No report. † Plagué.

*Smallpox epidemic in Hiogo.*HIOGO, JAPAN, *December 29, 1896.*

SIR: Confirming my cablegram of the 21st ultimo, announcing the prevalence of smallpox in epidemic form at Hiogo (Kobo), and my dispatch to the Department of State of the same date, numbered 86, confirming said cablegram, I have the honor to report that since the appearance of the disease in epidemic form there have been 1,504 cases reported, of which 652 have resulted fatally. The sanitary authorities seem to have the epidemic well under control. The number of cases reported daily are on the decrease, and I take pleasure in expressing the belief that the authorities will be able, in the near future, to stamp out the disease. Vaccination is compulsory, and a large staff of native

physicians are employed in vaccinating the Japanese in the infected city and throughout the different subdivisions of the keow or prefecture.

I have the honor to be, sir, your obedient servant,

JAS. F. CONNELLY,  
United States Consul.

Hon. ASSISTANT SECRETARY OF STATE.

STATISTICAL REPORTS.

AUSTRALIA—*New South Wales—Newcastle.*—Month of November, 1896. Estimated population, 15,331. Total deaths, 22. No deaths from contagious diseases.

*Sydney.*—Month of November, 1896. Estimated population, 408,500. Total deaths, 448, including enteric fever, 6, and diphtheria, 5.

BAHAMAS—*Dunmore Town.*—Two weeks ended January 15, 1897. Estimated population, 1,472. Total deaths, 2. No deaths from contagious diseases.

*Governors Harbor.*—Two weeks ended January 16, 1897. One death. No death from contagious disease.

*Green Turtle Cay—Abaco.*—Two weeks ended December 31, 1896. Estimated population, 3,900. No deaths.

*Inagua.*—Month of December, 1896. Estimated population, 1,200. No deaths.

BERMUDA.—Two weeks ended January 8, 1897. Estimated population, 15,013. Total deaths, 3. No deaths from contagious diseases.

CUBA—*Manzanillo.*—Four weeks ended December 31, 1896. Estimated population, 14,000. Total deaths, 88, including typhus fever, 5, and enteric fever, 13.

FRANCE—*Nantes.*—Month of December, 1896. Estimated population, 125,757. Total deaths, 262, including diphtheria, 2, and measles 2.

*St. Etienne.*—Two weeks ended January 5, 1897. Estimated population, 135,784. Total deaths, 119, including enteric fever, 1, and scarlet fever, 1.

GREAT BRITAIN—*England and Wales.*—The deaths registered in 33 great towns of England and Wales during the week ended January 9 correspond to an annual rate of 19.4 a thousand of the aggregate population, which is estimated at 10,992,524. The highest rate was recorded in Liverpool, viz, 23.6, and the lowest in Croydon, viz, 10.8 a thousand.

*London.*—One thousand five hundred and eighty deaths were registered during the week, including measles, 12; scarlet fever, 21; diphtheria, 71; whooping cough, 31; enteric fever, 9, and diarrhea and dysentery, 11. The deaths from all causes correspond to an annual rate of 18.5 a thousand. In greater London 2,064 deaths were registered, corresponding to an annual rate of 17.1 a thousand of the population. In the "outer ring" the deaths included 14 from diphtheria, 8 from measles, 13 from whooping cough, and 5 from scarlet fever.

*Ireland.*—The average annual death rate represented by the deaths

registered during the week ended January 9 in the 16 principal town districts of Ireland was 29.6 a thousand of the population. The lowest rate was recorded in Tralee, viz, 5.6, and the highest in Waterford, viz, 52.5 a thousand. In Dublin and suburbs 236 deaths were registered, including scarlet fever, 4; measles, 9; whooping cough, 19; 4 from enteric fever, and 1 from typhus.

*Scotland.*—The deaths registered in 8 principal towns during the week ended January 9, correspond to an annual rate of 22.8 a thousand of the population, which is estimated at 1,549,907. The lowest mortality was recorded in Aberdeen, viz, 18.4, and the highest in Perth, viz, 32.4 a thousand. The aggregate number of deaths registered from all causes was 680, including scarlet fever, 10; diphtheria, 3; measles, 45, and whooping cough, 20.

NORFOLK ISLAND.—Month of November, 1896. Estimated population, 858. Two deaths, including 1 from whooping cough.

ST. HELENA.—Three weeks ended December 19, 1896. Estimated population, 3,600. Total deaths, 3. No deaths from contagious diseases.

MORTALITY TABLE, FOREIGN CITIES.

Cities.	Week ended.	Estimated population.	Total deaths from all causes.	Deaths from—									
				Cholera.	Yellow fever.	Smallpox.	Typhus fever.	Enteric fever.	Scarlet fever.	Diphtheria.	Measles.	Whooping cough.	
Alexandria.....	Oct. 21.....	231,396	184			1		1		9			
Do.....	Oct. 28.....	231,396	169							3			
Do.....	Nov. 4.....	231,396	169	1				3		4			
Do.....	Nov. 11.....	231,396	177			1		1		6			
Amapala.....	Dec. 19.....	1,500	0										
Do.....	Dec. 25.....	1,500	0										
Do.....	Jan. 2.....	1,500	0										
Amherstburg.....	Jan. 16.....	2,300	1										
Amsterdam.....	Jan. 9.....	498,429	150						1	2		3	
Belfast.....	do.....	277,354	153					2	1		6	8	
Belize.....	Jan. 15.....	13,000	10										
Belleville.....	Jan. 11.....	10,459	3										
Do.....	Jan. 18.....	10,459	7										
Birmingham.....	Jan. 9.....	501,241	207					3	3	6	2	11	
Bologna.....	Jan. 2.....	148,224	101							1			
Bombay.....	Dec. 22.....	821,764	*1,416								6		
Bradford.....	Jan. 9.....	221,610	78					1			3	1	
Bristol.....	do.....	232,242	97						2	1		4	
Brussels.....	Jan. 2.....	507,985	172					1		2	1		
Cairo.....	Oct. 21.....	374,838	264	1		1		2		6		2	
Do.....	Oct. 28.....	374,838	315					3	5	9			
Do.....	Nov. 4.....	374,838	309			1		1		5	1	3	
Do.....	Nov. 11.....	374,838	332			1		1		8	1	1	
Calcutta.....	Dec. 12.....	681,560	454	29								1	
Callao.....	Dec. 20.....	20,000	21			1							
Do.....	Dec. 27.....	20,000	14										
Cardenas.....	Jan. 2.....	23,517	80		2	2	1	1					
Do.....	Jan. 9.....	23,517	39		3	5	4	2			1		
Catania.....	Jan. 5.....	120,000	61					2	1				
Champerico.....	Dec. 27.....	931	0										
Chatham.....	Jan. 18.....	9,052	3										
Christiania.....	Jan. 2.....	182,856	79					2			1	3	
Do.....	Jan. 9.....	182,856	71									1	
Cienfuegos.....	Jan. 3.....	24,030	29		1								
Do.....	Jan. 17.....	24,030	28			1							
Coaticook.....	Jan. 16.....	2,500	1							2			
Copenhagen.....	Jan. 2.....	333,714	29							2	8	3	
Crefeld.....	Jan. 9.....	108,600	29							1			
Dublin.....	do.....	350,000	236				1	4	4		9	19	
Flushing.....	do.....	16,300	8										
Frankfort on the Main.....	do.....	236,000	55					1				3	
Funchal.....	Jan. 2.....	35,665	12					2					
Ghent.....	Jan. 9.....	157,214	82							1		2	
Gibraltar.....	Jan. 3.....	25,900	12							1			
Girgenti.....	Jan. 2.....	24,428	13							2			
Glasgow.....	Jan. 9.....	714,919	356			2		5	2	41		14	
Gothenburg.....	Dec. 26.....	114,527	40						1	3	1	1	
Do.....	Jan. 2.....	114,527	41							2		4	
Guayaquil.....	Dec. 25.....	50,000	55		9								
Do.....	Jan. 1.....	50,000	71			2							
Halifax.....	Jan. 16.....	38,700	12										
Hamburg.....	Jan. 9.....	625,552	194						1	4		1	
Hongkong.....	Dec. 12.....	232,682	12			1							
Honolulu.....	Dec. 19.....	23,000	8										
Do.....	Dec. 26.....	23,000	8										
Do.....	Jan. 2.....	23,000	13										
Iquique.....	Dec. 12.....	33,106	54										
Do.....	Dec. 19.....	33,106	45										
Do.....	Dec. 26.....	33,106	28										
Kingston, Canada.....	Jan. 22.....	18,087	8										
Konigsberg.....	Jan. 9.....	171,700	172					1		2		3	
Leeds.....	do.....	402,449	48						2	3	6	3	
Leghorn.....	do.....	103,507	15										
Licata.....	Jan. 2.....	20,000	54			1	2					1	
Liege.....	Jan. 9.....	163,107	280					4	6	2	7	8	
Liverpool.....	do.....	644,129	1										
Livingston.....	do.....	2,000	11										
London, Canada.....	Jan. 16.....	34,855	2,064					10	26	85	20	44	
London, England.....	Jan. 9.....	6,291,677	430					6	3	1	1	7	5
Madrid.....	Jan. 6.....	482,816	229			26		8					
Manchester.....	Jan. 9.....	536,426	6										
Matamoras.....	Jan. 15.....	12,000											

\* 226 deaths from bubonic plague.

MORTALITY TABLE, FOREIGN CITIES—Continued.

Cities.	Week ended.	Estimated population.	Total deaths from all causes.	Deaths from—										
				Cholera.	Yellow fever.	Smallpox.	Typhus fever.	Enteric fever.	Scarlet fever.	Diphtheria.	Measles.	Whooping cough.		
Mayence.....	Jan. 9.....	74,917	27											
Messina.....	Jan. 2.....	107,000	28											
Do.....	Jan. 9.....	107,000	86											
Montevideo.....	Nov. 14.....	215,061	69			1								
Do.....	Dec. 19.....	215,061	57											
Moscow.....	Dec. 26.....	800,000	486				4	1			1			
Do.....	Jan. 2.....	800,000	500							9	17	13	5	2
Munich.....	do.....	406,000	183				5							6
Naples.....	Dec. 26.....	542,386	171					1		7	1	5		
Do.....	Jan. 2.....	542,386	200							8				
Newcastle on Tyne.....	Jan. 9.....	212,223	91										8	
Odessa.....	Jan. 2.....	363,000	139			5		3	16		1			2
Osaka and Hiogo.....	Dec. 12.....	161,120	165			69		7						
Do.....	Dec. 26.....	161,120	168			58		3						
Palermo.....	Jan. 2.....	273,000	140											
Para.....	do.....	140,000	33			3					7			
Paris.....	Jan. 9.....	2,511,965	1,011			1		4	1	9	6	7	8	
Plymouth.....	do.....	89,696	42											
Frague.....	Jan. 2.....	197,634	159							2	3	10		
Do.....	Jan. 9.....	197,634	139					2			1	5	1	
Puerto Cortes.....	Jan. 13.....	2,000	1											
Queenstown.....	Jan. 2.....	15,000	2											
Do.....	Jan. 9.....	15,000	3											
Rheims.....	Jan. 2.....	108,943	36					1						
Do.....	Jan. 9.....	108,943	56					1			1			
Rio de Janeiro.....	Dec. 26.....	650,000	275		5	1		2						
Rotterdam.....	Jan. 9.....	286,104	127						1	2	3			
Sagua la Grande.....	Jan. 2.....	17,536	24		3									
Do.....	Jan. 9.....	17,536	22		3									
St. Petersburg.....	Jan. 2.....	1,013,000	590					20	13	27	5		4	
St. Stephens.....	Jan. 16.....	3,000	0											
San Pedro.....	Jan. 9.....	3,800	1											
Schiedam.....	do.....	26,233	10											
Sheffield.....	do.....	350,800	140					2	3					
Sonneberg.....	Dec. 26.....	12,150	8					1						
South Shields.....	Jan. 9.....	95,798	31											1
Southampton.....	Jan. 2.....	94,093	33									1		1
Do.....	Jan. 9.....	94,093	30							1				1
Stettin.....	Jan. 2.....	140,000	65							2	1			1
Stockholm.....	do.....	267,100	97						1	1	1	2		1
Sunderland.....	Jan. 9.....	142,107	108						1	1		1		
Swanes.....	Oct. 3.....	98,250	27											2
Do.....	Oct. 10.....	98,250	26						1					1
Do.....	Oct. 17.....	98,250	24								1			1
Do.....	Oct. 24.....	98,250	35											1
Do.....	Oct. 31.....	98,250	43					2						1
Do.....	Nov. 7.....	98,250	30					1		1				4
Do.....	Nov. 14.....	98,250	42											2
Do.....	Nov. 21.....	98,250	41											2
Do.....	Nov. 28.....	98,250	42											3
Do.....	Dec. 5.....	98,250	53											1
Do.....	Dec. 12.....	98,250	45							1				2
Do.....	Dec. 19.....	98,250	45											5
Do.....	Dec. 26.....	98,250	39											
Trapani.....	Jan. 2.....	43,095	14											
Tuxpan.....	do.....	10,280	17											
Do.....	Jan. 9.....	10,280	6			1								
Venice.....	Dec. 26.....	161,938	52											
Do.....	Jan. 2.....	161,938	64								1			
Vera Cruz.....	Jan. 14.....	27,065	41											
Yarmouth.....	Jan. 16.....	6,500	1											
Yokohama.....	Dec. 24.....	170,252	.....			1					1			

By authority of the Secretary of the Treasury :

WALTER WYMAN,  
Supervising Surgeon-General U. S. Marine-Hospital Service.